HEALTH AND SAFETY PLAN ACT 2 REMEDIAL INVESTIGATION

Prepared for
ROHM AND HAAS COMPANY
Philadelphia, Pennsylvania

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This Health and Safety Plan (HASP) applies to workers of URS and to URS subcontractors performing tasks related to the Act 2 Remedial Investigation Process, focused on East Areas 1, 2, 3, 4, and 5. The HASP establishes guidelines and requirements for worker safety.

URS will conduct an Act 2 Remedial Investigation (RI) designed to characterize current conditions in the East Production Area. East Areas 1, 2, and 5 represent the bulk of the former East Production Area and contain features such as existing and demolished production areas, the power house, tank farms, abandoned USTs and utilities including chemical sewers. Sampling locations in these areas were selected to fulfill a set of key data objectives. East Areas 3 and 4 are suspected to be less impacted by facility operations including the area between the railroad tracks and the Delaware River to the east (Area 3) and the former Dithane Production Area and parking lot (Area 4).

RI objectives will be met by collecting soil, soil gas, and groundwater samples. 125 soil samples will be collected from target intervals in soil borings made with the aid of a GeoProbe™. 21 soil vapor monitoring points will also be installed with the aid of a GeoProbe™. 7 shallow groundwater monitoring wells will be installed with the aid of a truck mounted hollow stem auger drilling rig. URS field personnel for the RI will include Melissa Pitchford, Justin Bridge, and Randy Crispino. A field surveying crew will locate the soil borings, well locations, and vapor monitoring points, and utility designation and locating services will be utilized on an as needed basis.

The surrounding community is often sensitive to work conducted for Rohm and Haas in the Bridge Street area. However, collection of information from the proposed locations both on- and off-site is very important in achieving the overall objectives of this project. URS is aware of the importance of maintaining good relations with the community and will conduct all work accordingly.

The following sections discuss applicable Health and Safety Procedures to be followed during the described work. Table 1 (following page) is a matrix, which can be used to identify potential hazards and their appropriate control measures.

Table 1: Hazard Analysis Matrix

Hazard	Hazard Elimination	Hazard Control or Corrective Action
Chemical Hazards		
Inhalation exposure to site specific chemicals of concern from vapors	Establish site exclusion zone and restrict access of non-essential personnel to areas within exclusion zones. Minimize duration or eliminate open exposure of waste materials or contaminated media to atmosphere	Use of properly calibrated air monitoring equipment. Appropriately train all individuals performing field work in respiratory PPE use. Implement respiratory protection plan and use of appropriate PPE with respect to action levels shown in HASP. Personnel ambient air monitoring. Implement proper sample handling procedures. Medical surveillance
Dermal contact and adsorption of site specific chemicals of concern from soil or groundwater sampling	Minimize duration or eliminate open exposure of waste materials or contaminated media to atmosphere.	Use of properly calibrated air monitoring equipment to evaluate sample contaminant levels. Appropriately train all individuals performing field work in proper sampling procedures and use of PPE. Identify appropriate gloves to provide protection against site specific chemicals of concern.
Inhalation of contaminated dusts containing site specific chemicals of concern	Minimize duration or eliminate open exposure of waste materials or contaminated media to atmosphere. Establish site exclusion zone and restrict access of non-essential personnel to areas within exclusion zones.	Implement dust control procedures as appropriate to the task. Use of properly calibrated air monitoring equipment to evaluate sample contaminant levels. Properly train all field personnel in use of PPE to control dust inhalation hazards.
Ingestion of contaminants	Restrict all eating, drinking, smoking from job site or exclusion area.	Train personnel in proper decontamination and personal hygiene practices.

Table 1: Hazard Analysis Matrix (continued)

Hazard	Hazard Elimination	Hazard Control or Corrective Action
Physical Hazards		
Head injuries; struck by falling objects or overhead structures	Properly maintain drill rigs so as to prevent cable or rope failures and other failures causing falling objects. Proper preparation of work area and securing of job site to eliminate overhead obstructions &/or remove risks of falling objects.	Restrict work areas where individuals may be working above walkways or other areas. Proper use of hard hats on job site.
Eye injuries from splashes or flying objects/debris	Proper maintenance of hydraulic, water, and air hoses on drill rig. Proper maintenance of pumps and associated hoses used for water sampling. Establish exclusion zone to prevent or restrict access to work area by non-essential personnel.	Proper use of safety glasses with side shields and where appropriate face shields.
Hand injuries from rotating equipment, sampling equipment.	Proper maintenance and inspection of drill rig prior to each use. Avoid use of cracked, chipped, or otherwise damaged glass sample containers.	Properly train employees in use of drill rig, sampling equipment, and power or hand tools. Use of appropriate gloves to provide protection from cuts.

Table 1: Hazard Analysis Matrix (continued)

Hazard	Hazard Elimination	Hazard Control or Corrective Action
Foot injuries; cuts, sprains, pinched or crushed bones	Proper maintenance and inspection of drill rig prior to each use. Appropriate preparation and maintenance of working and walking surfaces, eliminate ruts, obstacles. Proper housekeeping to eliminate tripping hazards. Establish exclusion zone to prevent or restrict access to work area by non-essential personnel.	Properly train employees in use of drill rig, sampling equipment, and power or hand tools. Use of ANSI approved steel-toed work boots by all field personnel.
Back Injuries	Job safety analysis for tasks requiring lifting and repetitive lifting tasks. Limit weights of bags of cement, filter pack, grout, etc. to 45 lbs. or less.	Train employees in proper lifting techniques. Use a partner in all lifts >45 lbs. Proper training and use of back belts for repetitive lifting tasks which can not be eliminated. Use hoists or other devices to move equipment as appropriate. Refer to URS SMS 069.
Walking / working surfaces; slips, trips, and falls	Proper work site preparation; eliminate holes, ruts, tree stumps, other natural or man made tripping hazards. Proper housekeeping; coil hoses and return to storage, return tools & extension cords to proper locations when task is completed. Prevent spills & cleanup any pooled liquids or spills which create slippery surfaces.	Clearly identify with caution tape or safety cones all hazards which can not be removed. Create an exclusion zone to restrict access to work area or area where hazardous walking surfaces can not be eliminated. Require non-skid soles in good condition on all safety work boots and overboots worn by workers at the job site.

Table 1: Hazard Analysis Matrix (continued)

Hazard	Hazard Elimination	Hazard Control or Corrective Action
Noise from drill rig or other heavy equipment.	Create appropriate exclusion zone to protect non-essential workers from excessive noise exposure. Inspect drill rig and other related equipment for proper mufflers and sound suppression equipment.	Train site personnel in use of hearing protection. Use appropriately calibrated monitoring equipment to measure and document noise levels. Refer to URS SMS 026.
Illumination	Control working hours to appropriate daylight periods.	Provide illumination when needed to ensure proper visibility at all times (one should be able to easily read a newspaper if area is properly lit).
Underground & overhead utility dangers	Ensure proper and complete utilities delineation is completed prior to start of work. De-energize utilities if needed due to either clearance issues or uncertainty of location; perform lock-out/tag-out (LOTO).	Create an exclusion zone to restrict access to work area. Only trained operators operate drilling or other excavating equipment. All other field personnel remain a safe distance away from equipment. Refer to URS SMS 034.
Explosive vapors	Proper use of safety permits for all related activities in restricted areas.	Proper use of monitoring equipment to ensure absence of vapors at on near LEL.
Electrical shock	Proper use of ground fault protectors for all electrical equipment. De-energize equipment if performing service or maintenance, perform LOTO.	Inspection and proper maintenance of all electrical tools, generators, pumps. Proper training of personnel in use of such tools. Proper use of safety permit and LOTO.

Table 1: Hazard Analysis Matrix (continued)

Hazard	Hazard Elimination	Hazard Control or Corrective Action
Vehicle Traffic	Restrict non-task specific vehicle access to work site.	All employees to wear orange traffic vests when working in streets or roadways where traffic can not be restricted. All site vehicles shall be equipped with functioning backup alarms. Refer to URS SMS 032.
Heat Stress	Restrict work to cooler times of day, and cooler times of year.	Train site employees in recognition of signs/symptoms, ingest adequate fluids, and take frequent breaks.
Natural / Biological Hazards		
Poison Ivy	Properly clear job site. Clearly ID areas with poison ivy if it has not been removed.	Train site personnel in recognition, use of PPE, and decontamination procedures.
Ticks (Lyme disease)	Properly clear job site.	Train site personnel in recognition, use of PPE and insecticides.
Snakes & Snapping Turtles	Properly clear job site.	Train site personnel in recognition and awareness.

2.1 STAFF ORGANIZATION, RESPONSIBILITY, AND AUTHORITY

Health and Safety responsibility lies in a chain of command headed by the Project Manager (PM), maintained in the field by the Site Safety Officer, continuing to all field personnel. Consultation on health and safety issues, and internal review and approval of Health and Safety Plans is provided by a Regional Health and Safety Manager (RHSEM) and the Operating Unit Health and Safety Representative (HSER).

The responsibilities and authority of the Project Manager, Rohm and Haas Philadelphia Plant Safety Officer, Site Safety Officer, Operating Unit Health, Safety, and Environment Representative and Regional Health, Safety, and Environmental Manager are described below.

2.1.1 Project Manager

The Project Manager (PM), Mr. Geoffrey Arbogast, will be responsible for the overall implementation and monitoring of the health and safety program by:

- Providing adequate resources to conduct the site investigation.
- Ensuring appropriate protective equipment is available and properly used by all personnel, in accordance with the HASP.
- Ensuring Health and Safety awareness by providing personnel with proper training and familiarity with Health and Safety procedures and contingency plans.
- Supervising and monitoring the safety performance of all personnel to ensure that proper work practices are conducted in accordance with the HASP.
- Correcting any work practices or conditions that would expose personnel to possible injury or hazardous conditions.
- Supervising compliance with health and safety requirements and enforcing disciplinary actions when unsafe practices occur.

Authority

- Determining matters relating to schedule, cost, and personnel assignments on hazardous waste management projects that are not safety related.
- Can temporarily suspend field activities, if health and safety of personnel are endangered, pending an evaluation by the HSER and/or RHSEM.
- Can temporarily suspend an individual from field activities for infractions of the Health and Safety Plan, pending an evaluation by the HSER or RHSEM.

2.1.2 Rohm and Haas Philadelphia Plant Remediation Coordinator

The Rohm and Haas Philadelphia Plant, Remediation Coordinator, Al Ambrosino, under the direction of the facility Environmental Health and Safety Manager, Mr. Jeff Kozub, will review and approve all health and safety provisions set forth in the HASP. Mr. Ambrosino has the

authority to suspend all work tasks related to the field program if not conducted in a safe manner or conditions exist that would expose personnel to possible injury or hazardous conditions.

2.1.3 Site Safety Officer

The URS Site Safety Officer (SSO) will be Melissa Pitchford, who is responsible for the proper implementation of the HASP. The SSO reports to the HSER in matters pertaining to site safety. The SSO is designated by the PM for a specific project based on appropriate experience and with the approval of the HSER.

The responsibilities of the SSO are to:

1. Enforce compliance with the Site Safety Plan.
2. Conduct on-site safety briefings for all site personnel.
3. Manage health and safety equipment (respirators, instruments, boots, gloves, and suits) used at the site.
4. Perform air-monitoring as specified in the Site Safety Plan.
5. Establish work/rest regimen in conjunction with site manager.
6. Coordinate emergency response in conjunction with local authorities (hospital, fire, and police).
7. Continuously monitor health and safety conditions during the site work.
8. Maintain a site safety log to record air monitoring results, weather conditions, employees on site, safety problems, and similar information.
9. Report all incidents and injuries immediately to the Plant Remediation Supervisor and to the HSER.
10. Provide a post-site work review to the HSER regarding safety.

Authority

The SSO shall have the authority to stop work if conditions are deemed unsafe. The SSO also has authority to temporarily remove an individual from the site if he/she is not complying with the Health and Safety Plan. In both cases, the SSO will promptly confer with the HSER regarding follow-up actions.

2.1.4 Operating Unit Health, Safety, and Environment Representative (HSER)

The HSER for the Fort Washington Office of URS is Mr. Doug Mueller, CIH.

Responsibilities

- Interface with project managers as may be required in matters of health and safety.
- Report to RHSEM on health and safety matters.
- Develop or review and approve appropriate Health and Safety Plans for hazardous waste management projects and submit these plans to the RHSEM for approval.

- Appoint or approve Site Safety Officers to assist in implementing the Health and Safety Plan.
- Monitor compliance with approved Health and Safety Plans.
- Assist Project Managers in seeing that proper health and safety equipment is available for projects in the business unit.
- Approve personnel to work on hazardous waste management projects with regard to medical examinations and health and safety training.

Authority

- Can suspend work or otherwise limit exposures to personnel, if a Health and Safety Plan appears to be unsuitable or inadequate.
- Can direct personnel to change work practices, if they are deemed to adversely affect the health and safety of personnel.
- Can remove personnel from projects, if their actions or condition endangers their health and safety or the health and safety of co-workers.

2.1.5 Regional Health, Safety, and Environment Manager (RHSEM)

The Regional Health, Safety, and Environment Manager for this project is Mr. Ben Bertolotti, CIH.

Responsibilities

- Direct the implementation of the Health and Safety Program within the operating group and provide recommendations for improvement of the program.
- Coordinate health and safety activities of the operating units in the operating group.
- Review and approve Health and Safety Plans.
- Investigate reports of incidents or accidents, and report accidents or incidents to the Corporate Health, Safety, and Environment Manager (CHSEM).
- Assist CHSEM in implementing training for employees in the operating group.
- Provide industrial hygiene/chemical safety guidance to HSER.
- Audit key aspects of Health and Safety Program.

Authority

- Approve the qualifications of employees to work at hazardous waste sites.
- Approve project Health and Safety Plans.
- Establish employee training and medical surveillance policies.
- Stop URS work at a hazardous waste site if health and safety conditions warrant such action.

3.1 SUMMARY OF FIELD ACTIVITIES

The Act 2 Remedial Investigation Process for the Rohm and Haas Philadelphia Plant includes:

- Survey and locate soil borings, vapor monitoring points, and well locations.
- Locate and designate underground utilities.
- Obtain soil samples from soil borings to provide data to characterize unsaturated soil quality.
- Install soil gas vapor monitoring points
- Install shallow groundwater monitoring wells.

3.1.1 GEOPROBE™ AND HSA DRILLING OPERATIONS

Soil borings will be advanced using a truck-mounted, pneumatic, direct-push method (GeoProbe™) of drilling. The subcontractor will advance the GeoProbe™ to the top of the water table or, in Area 2, to the top of clay, as specified in the Work Plan. The soil profile will be described by the URS field geoscientist and scanned for organic vapors with a photoionization detector (PID) to provide qualitative data regarding volatile organic compound (VOC) concentrations in the soil. Vapor monitoring points will be bored in the same manner.

Shallow groundwater monitoring wells will be installed using a truck mounted hollow stem auger drilling rig. The subcontractor will be advance the augers to a depth of about 25 feet, and install the wells in Areas 3 and 4.

3.1.2 EQUIPMENT DECONTAMINATION

Before any purging or sampling begins, all well probes, pumps, bailers, and other sampling devices will be decontaminated in accordance with the Work Plan. If dedicated equipment is used, it will be triple rinsed with distilled water. Mobile decontamination supplies will be provided so that equipment can be decontaminated in the field. Each piece of purging or sampling equipment shall be decontaminated before sampling operations and between each well. Used solutions will be placed in the container with purged well water for disposal. Additional information regarding equipment decontamination is provided in Section 9.

3.1.3 WASTE MANAGEMENT

During the RI activities at the Rohm and Haas Philadelphia Plant, various potentially-hazardous and non-hazardous wastes may be generated. Specifically, excess soil from drilling, groundwater from well development, decontamination fluids and disposable PPE will be generated. General guidelines for the management of these wastes are provided in this section.

As a rule, like-materials may be collected in the same container. For example, solids will be segregated from liquids and potentially hazardous materials will be segregated from non-hazardous materials. Likewise, solids such as PPE and trash will not be containerized with soil or groundwater. Potentially hazardous materials, such as decontamination fluids and

groundwater will be contained in Department of Transportation (DOT)-certified containers as approved by Rohm and Haas. Typically, soil or groundwater will be placed in drums, labeled and staged in an area designated by Rohm and Haas where they will be temporarily stored and managed for disposal by Rohm and Haas Company personnel.

If materials are determined to be non-hazardous, they will be managed and disposed of as residual waste. Groundwater and decon fluids will be discharged into the plant process sewer and conform to the pretreatment permit issued by the City of Philadelphia Water Department.

Disposable PPE and decontaminated miscellaneous disposable sampling equipment (e.g., disposable filters) and miscellaneous trash will be disposed in any of the several residual waste dumpsters located at designated locations throughout the Facility.

If a spill occurs, the Facility's release reporting procedure must be followed as specified in the Preparedness, Prevention and Contingency Plan (PPC) maintained by the Facility. Any material released will be properly cleaned up and properly disposed.

4.1 CHEMICAL HAZARDS

4.1.1 Dissolved Phase Constituents

Groundwater quality data collected from monitoring wells in the upper and lower water-bearing units below the facility indicate the presence of dissolved constituents listed in Table 2. The list and the following discussion are based on groundwater quality monitoring during the September 1997 comprehensive round. The list includes volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides and inorganics. Chemical compounds listed in the tables can affect the body if they are inhaled or swallowed, or if they come in contact with the eyes or skin. The principle routes of exposure at the site are through inhalation and skin contact.

The chemicals of concern, which may be encountered during the project, are listed below and are representative of maximum concentrations in groundwater. The chemicals include: 1,2-dichloroethane, 1,2-dichloropropane, chlorobenzene, chloroform, ethylbenzene, methylene chloride, toluene, xylene, 4,4'-DDD, 4,4'-DDT, bis(2-chloroethyl)ether, naphthalene, vinyl chloride, benzo(b)fluoranthene, and benzo(a)anthracene.

4.1.2 Chemical Hazard Health Effects

In the unlikely event of an exposure, an overview of exposure risks and symptoms of over exposure to the chemicals of concern are provided in this section and will be communicated to all personnel during site orientation.

1,2-Dichloroethane: 1,2-Dichloroethane is a colorless liquid with a pleasant odor which decomposes slowly and becomes acidic and dark in color. Short-term exposure symptoms may include: irritation to the eyes; nausea; vomiting; and dermatitis and skin irritation.

1,2-Dichloropropane: 1,2-Dichloropropane is a colorless liquid with a chloroform-like and pesticide odor. Short-term exposure symptoms may include: irritation to the eyes, skin, and respiratory system; drowsiness; and light-headedness.

4-Methyl-2-pentanone: 4-Methyl-2-pentanone is a colorless liquid with a pleasant odor. Short-term exposure symptoms may include: irritation to the eyes, skin, and mucous membranes; headache; and dermatitis.

Chlorobenzene: Chlorobenzene is a colorless liquid with an almond-like odor. Short-term exposure symptoms may include: irritation to the eyes, skin, and nose; drowsiness; and irritation to the respiratory system.

Chloroform: Chloroform is colorless liquid with a pleasant odor. Short-term exposure symptoms may include: irritation to the skin and eyes; dizziness; mental dullness; nausea; and headache.

Ethylbenzene: Ethylbenzene is a colorless liquid with an aromatic odor. Short-term exposure symptoms may include: irritation to eyes, skin, and mucous membrane; headache; and dermatitis.

Methylene Chloride: Methylene Chloride is a colorless liquid with a chloroform-like odor. Short-term exposure symptoms may include: irritation to the eyes and skin; fatigue; weakness; headache; and tingling of the limbs.

Toluene: Toluene is a colorless liquid with a sweet, pungent benzene-like odor. Short-term exposure symptoms may include: irritation to the eyes and nose; fatigue; weakness; euphoria; headache, dizziness; dilated pupils; and dermatitis.

Xylene: Xylene is a colorless liquid with an aromatic odor. Short-term exposure symptoms may include: irritation to the eyes, skin, nose and throat; dizziness; excitement; drowsiness; staggering gait; nausea; vomiting; abdominal pain; and dermatitis.

4,4'-DDD: Exposure to 4,4'-DDD via inhalation can be fatal or can cause irritation of the nose, throat, and lungs, coughing, breathing difficulty, shortness of breath, headache, nausea, and vomiting. Eye exposure may cause tearing or temporary corneal injury, dermal contact may result in slight skin irritation. 4,4'-DDD is fatal if ingested.

4,4'-DDT: 4,4'-DDT is composed of colorless crystals or off-white powder with a slight aromatic odor. Symptoms of exposure may include numbness of the tongue, lips, or face, tremors, dizziness, confusion, headache, fatigue, convulsions, vomiting, and irritation of the eyes and skin.

Bis(2-chloroethyl)ether: Bis(2-chloroethyl)ether is a colorless liquid with a chlorinated solvent-like odor. Symptoms of exposure include irritated nose, throat, cough, nausea, and vomiting.

Naphthalene: Naphthalene is a colorless to brown solid with an odor of mothballs. Symptoms of exposure may include irritation to respiratory system, eyes, and skin, including burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Vinyl chloride: Vinyl chloride is a colorless gas or liquid with a pleasant odor at high concentrations. Symptoms of exposure may include abdominal pain, gastro-intestinal bleeding, hepatomegaly, pallor of extremities.

Benzo(b)fluoranthene: Benzo(b)fluoranthene is an off-white to tan fibrous solid and is a known carcinogen which is harmful if swallowed, through dermal contact, and via inhalation.

Benzo(a)anthracene: Benzo(a)anthracene is a solid which is a known carcinogen. Short term exposure via ingestion, inhalation, or dermal contact can result in death.

In addition to the potential for exposure to chemicals present in the soils and groundwater, there is the potential for exposure to chemicals used for equipment decontamination, instrument calibration, and sample preservation. These chemicals include: Alconox, nitrogen-balance methane and oxygen mixture, nitrogen-balance isobutylene, sulfuric acid, nitric acid, hydrochloric acid, and isobutyl alcohol. MSDS sheets for these chemicals are provided in Appendix A.

4.1.3 NATURE AND EXTENT OF NON-AQUEOUS PHASE LIQUID

A dense non-aqueous phase liquid (DNAPL) has been previously identified in monitoring well TW-13A near Building 6B in the East Production Area. Chemical compounds associated with the DNAPL as well as the highest concentration and TLVs are listed in Table 4. Because encountering DNAPL can not be ruled out during the sampling rounds, these data are provided herein. Table 4 also lists the Rohm and Haas exposure limits reported to URS that have been set lower than the TLVs. In addition to the obvious inhalation hazard, there is a significant hazard associated with skin and eye contact with the DNAPL.

An explosion hazard also was previously encountered in the area near Building 6F, in the East Production Area. During a soil-boring program in September 1992, work was stopped at two locations near Building 6F because limits for combustible gases were exceeded. For all sampling activities, an explosion hazard is encountered when any combustible gases are detected by a combustible gas indicator (CGI). Initial monitoring of the well headspace with a CGI will be required after removing the well cap, prior to conducting measurements and sampling. If at any time, 1 percent of the Lower Explosive Limit (LEL) is exceeded (any meter response), the Site Safety Officer will direct the work to be halted. The well will be allowed to vent for approximately 10 minutes and then be checked for levels of combustible gases. If the explosion hazard still persists, then work at that location will be stopped and the well will be capped. Work will only resume when the CGI indicates no response, or 0 percent LEL.

A light floating non-aqueous phase liquid (LNAPL) was observed in measurable thickness in the upper water-bearing unit in three wells in the West Production Area. LNAPL has been detected at two locations [4 wells, P-6, TW-31S, MW-5 and IW-104 (Groundwater Recovery Trench)] in the West Production Area. The LNAPL is comprised of 2-octanone, 2-octanol, ethylbenzene, toluene, and xylenes and other associated hydrocarbons. The LNAPL in both locations is believed to have resulted from former material transfer and storage at the R7F tank farm. Constituents of LNAPL are identified in Table 3. LNAPL is collected and removed either at the groundwater recovery trench at the plant boundary with Bridge Street, or at the API separator in Building 87.

The chemicals of concern identified in LNAPL samples collected from P-6 were: ethylbenzene, toluene, and xylenes. 2-octanone and 2-octanol have low vapor pressures and are not expected to present a respiratory hazard, however, dermal protection is a concern. By eliminating these two chemicals as respiratory hazards, the chemicals of concern are xylenes, toluene, and ethylbenzene. Each of these chemicals has a Rohm and Haas exposure limit of 50 ppm assigned to them. MSDS sheets for 2-octanone and 2-octanol are provided in Appendix A.

Arsenic has also been identified in LNAPL. It is not expected to present a respiratory hazard since, in this situation, there is minimal risk for it to become airborne. Dermal protection will be provided by chemical resistant clothing during activities where exposure risks are high, as identified in Section 6.0.

4.2 PHYSICAL HAZARDS

Physical hazards are inherently present during soil boring and drilling activities. Common physical hazards include mechanical hazards; noise exposure associated with the operation of heavy equipment; slip-trip-fall hazards associated with the field environment; hazards associated with weather conditions; musculoskeletal injury resulting from lifting tasks; and explosion hazards from underground pipes or lines that may be encountered during the drilling process.

Vehicular traffic in the plant and on public thoroughfares may present a hazard when monitoring wells are located along roads. A truck or van assigned to the project will be parked, with 4-way flashers on, in a position that will shield workers from oncoming traffic. Workers will wear reflective safety vests whenever they are working in or along side a roadway. Traffic cones will also be employed at the discretion of the SSO to control traffic and secure the sampling location. The SSO will also determine if coordination with local police is needed for traffic control or to facilitate access to monitoring wells.

Drilling Equipment - Operation of Geoprobe™ and drill rig equipment during site activities presents potential physical hazards to personnel. During all site activities, personal protective equipment (PPE) such as steel-toed shoes, safety glasses or goggles, and hard hats should be worn whenever such equipment is present, and personnel should at all times be aware of the location and operation of sampling equipment, and take precautions to avoid getting in the way of its operation. See URS SMS 56, which is provided in Appendix B, for additional information.

Noise - The primary noise hazard at this site is from the Geoprobe™ drilling equipment. Whenever feasible, noise levels, identified as exceeding 85 decibels, will be reduced by means of personal protective equipment. Ear plugs and/or muffs will be worn at all times when URS personnel are within 25 feet of operating equipment. Hearing protection will also be worn in the vicinity of generators, concrete cutters, and any other high noise emitting equipment. See URS SMS 26, which is provided in Appendix B, for additional information.

Slip-Trip-Fall Hazards - Slip-trip-fall hazards are common at field sites due to open holes; muddy, slippery or unstable surfaces; and equipment on the ground. While it is difficult to eliminate all slip-trip-fall hazards, implementing safe work practices, utilizing proper footwear, and keeping the work area free of obstructions will minimize risk of injury.

Steam Hazard - Steam cleaning equipment may be used for decontamination of the GeoProbe™ rig. Use of steam equipment introduces the potential for dermal burns and injury due to pressurized lines. This hazard will be mitigated by equipment inspection and proper usage.

Lifting Hazards - Field operations often require the performance of laborious tasks. All employees must implement proper lifting procedures, such as keeping the load close to the body, and using leg muscles instead of back muscles to perform lifting tasks. Additionally, employees will not attempt to lift large, heavy, or awkwardly shaped objects without assistance. See URS SMS 69 (Appendix B) for additional information.

Weather - Weather conditions are an important consideration in planning and conducting site operations. Extremely hot or cold weather can cause physical discomfort, loss of efficiency and personal injury. Of particular importance at drilling sites is heat stress, often resulting from the use of impermeable protective clothing, which decreases the body's natural cooling processes.

Potential weather hazard exists at the site include Heat Stress or Cold Stress depending on the season. The URS SMS 018, relevant to Heat Stress, is provided in Appendix B.

Lightning may accompany storms, creating an electrocution hazard during outdoor operations. To eliminate this hazard, weather conditions will be monitored and work suspended during electrical storms.

Underground Utilities - All proximal underground utility locations must be located by either URS or the drilling contractor prior to the commencement of drilling activities. The proper utility company personnel should certify the deactivation of utilities. See URS SMS 34 (Appendix B) for additional information.

Overhead Hazards - Overhead power lines pose a danger of shock or electrocution if the power line is contacted or severed during site operations. Prior to conducting work in areas where overhead lines could be impacted, the appropriate utility company will be notified and information will be obtained regarding the line voltage and the minimum separation distance required for work in this area. See URS SMS 34 (Appendix B) for additional information.

Work Area Protection - As the project operation may be undertaken in a roadway or parking lot, motor vehicles may be a hazard. Guidance on properly conning and flagging the work area is located in the Attachments. See URS SMS 32 (Appendix B) for additional information.

Groundwater and Soil Waste – Excess groundwater and soil will be placed in appropriate sized drums as designated by Rohm and Haas. Proper drum handling techniques must be practiced to prevent back, finger, and foot injuries.

5.1 ORGANIC VAPOR MONITORING

An organic vapor monitor will be used to detect concentrations of certain vapors in the air. The meter that may be used to monitor for organic vapors is a MiniRAE 2000, or similar Photoionization detector (PID). Readings will be taken in the employee-breathing zone during all intrusive work activities. It should be kept in mind that the organic vapor monitor detects mixtures of compounds simultaneously, and readings do not indicate concentrations of any individual compound when a mixture of compounds is present.

The detection method of the monitoring equipment depends on the ionization potential (IP) of the chemicals of concern. All chemicals detected in groundwater exhibit IPs of less than 11.5 eV. Therefore, a PID equipped with an 11.7 eV lamp will be used for air monitoring of organic vapors on the site.

Organic vapors will be monitored a minimum of every 15 minutes in the breathing zone of workers deemed to be subjected to the greatest exposure. If concentrations of organic vapors in the breathing zone attain an action level, monitoring will be performed continuously over an appropriate period to determine the need for an upgrade of PPE. Appropriate actions will be taken depending on organic vapor concentrations and action levels established in Section 6.1.

5.2 COMBUSTIBLE GAS MONITORING

A Combustible Gas Indicator (CGI) will be used to monitor the release of explosive levels of gases and vapors, including methane. A MultiRae Plus PGM 50-5P, or similar instrument will be used. Action levels are established in Section 6.1.

5.3 INSTRUMENT CALIBRATION

The organic vapor monitors and CGIs will be calibrated daily before the start of any activities requiring monitoring, using the manufacturer's specifications for calibration. Daily instrument calibrations will be documented in a project field logbook. Periodic response checks will be made to verify the instruments' functioning.

Drilling and well installation activities related to the project will be initiated in modified Level D protection. Modified Level D includes wearing gray polycoated tyvek suits or other suitable splash protection (i.e., rain gear), rubber overboots, latex inner gloves, nitrile outer gloves, hard-hat, and safety glasses. Work tasks will begin in modified Level D protection and will continue until air monitoring results reveal levels of organic vapors above action levels listed in Table 6-1. An upgrade to Level C protection will then be required. Level C protection comprises a full-face air purifying respirator (APR), with combination cartridges, to provide respiratory protection. Half-face respirators are not permitted to be worn for Level C protection. Dermal protection will be achieved by wearing either polycoated tyvek suits, neoprene boots or rubber overboots, nitrile gloves or PVC/nitrile gloves with a 16-inch gauntlet, splash goggles, and a hard-hat.

Work tasks that will not involve the risk of dermal exposure to contaminated groundwater or NAPL will not require the use of chemically resistant clothing, and will be conducted in standard level D protection. Steel toed shoes and eye protection must be worn for all work conducted on Rohm and Haas property and a hard hat must be worn at all times except in office-environments.

Level B protection will be worn under conditions where total organic vapors persist in the breathing zone at concentrations of greater than 50 ppm for a period of 5 minutes. Level B protection requires supplied air respirators and the maximum dermal protection provided in both Levels C and D. Additional training in the use of supplied air respirators will be required of personnel donning Level B gear. The ability to wear and knowledge of breathing apparatus must be demonstrated by the worker.

In accordance with 29 CFR 1910.120(h)(4), employees will be monitored to assess their exposure. Employee exposures must be characterized by monitoring high risk employees. To meet this requirement, total volatile organic vapors will be monitored using a photoionization detector-HNu (with an 11.7 eV probe) or equivalent. Monitoring will be periodically performed during activities associated with work tasks where exposure risks to organic vapors could be high.

6.1 ACTION LEVELS

Table 6-1: Organic Vapor Action Levels

Task	Initial PPE	Action Level/PPE Upgrade
Groundwater or Soil Sampling	Modified Level D	Within the breathing zone, Total Organic Vapors >3ppm for 5 minutes, upgrade to Level C. TOV >50ppm for 5 minutes, stop work to further assess the nature of airborne contamination, conduct personal air sampling to characterize TOV constituents, consult with the RHSEM. TOV>500ppm, stop work.
Groundwater Level Monitoring	Level D	Within the breathing zone, Total Organic Vapors >3ppm for 5 minutes, upgrade to Level C. TOV >50ppm for 5 minutes, stop work to further assess the nature of airborne contamination, conduct personal air sampling to characterize TOV constituents, consult with the RHSEM. TOV>500ppm, stop work.

Table 6-2: Oxygen and Combustible Gases Action Levels

Oxygen Content (%)	Action
> 20.5 to < 22.5	Perform Work
< 20.5	Leave Area, Return After Level Rises to Above 20.5%
Combustible Gases	**Action**
0% LEL	Perform Work
> 1% LEL	Stop Work, Leave Area, Return After Levels Drop to 0% LEL

6.2 PROTECTIVE EQUIPMENT

Protective equipment for field personnel is listed below. Donning of respirators (Number 6, below) is based on levels in Table 6-1.

1. A hard-hat must be worn by all personnel working within 25 feet of any heavy equipment or while in any area of the plant site.
2. Safety goggles or safety glasses with side shields will be worn by all personnel working within 25 feet of any heavy equipment or while working in any area of the plant site. Chemical splash goggles or face shield if splash hazard exists will be worn during work tasks that have groundwater NAPL exposure risks.
3. Waterproof gloves (Nitrile gloves with PVC or Latex inner gloves or PVC/nitrile gloves with a 16-inch gauntlet) will be worn by all project personnel engaged in work tasks where a dermal exposure risk to contaminated groundwater or NAPL exists.
4. Steel toed safety shoes will be worn by all project personnel working in operating areas. Waterproof and chemically resistant boot covers or boots must be worn for work tasks that have contaminated groundwater or NAPL exposure risks.
5. Polycoated Tyvek disposable coveralls or chemically resistant aprons will be worn by all personnel engaged in work tasks where there are contaminated groundwater or NAPL exposure risks. Tyvek suits (if worn) should be taped to gloves and boots with duct tape to limit the possibility of direct skin contact with waste materials.
6. MSA Ultra Twin Respirator (full-face) with GMC-H air-purifying cartridges for organic vapor and organic acid gases with a high efficiency particulate air (HEPA) filter or equivalent will be donned as required.
7. Workers in close proximity to potentially hazardous noise sources will wear hearing protection at the discretion of the SSO.

Used disposable personal protective equipment will be disposed of at the plant site in containers approved by plant personnel. No contaminated equipment will be carried off-site. The equipment will be placed in plastic bags and disposed of according to Rohm and Haas Philadelphia Plant protocols at the end of each day or as necessary. Reusable items which have been contaminated will be thoroughly washed with a solution of water and alconox between separate uses.

6.3 LEVELS OF PERSONAL PROTECTION

The personal protective equipment specified in this Plan will be provided for all field personnel. The following requirements are in accordance with OSHA regulations:

- Facial hair that interferes with proper fit of respirators must not be worn
- Eyeglasses that interfere with proper fit to full-face respirators must <u>not</u> be worn

Level D Personal Protective Equipment

- Hard hat
- Safety glasses, goggles, or face shield (if splash or dust hazard exists)
- Steel-toed and steel shank work boots
- Nitrile surgical gloves
- Ear plugs or muffs (at discretion of SSO)

Modified Level D Personal Protective Equipment

- Hard hat
- Safety glasses with side shields, goggles, or face shield (if splash or dust hazard exists)
- Steel-toed and steel shank work boots
- Nitrile rubber outer gloves or PVC/nitrile gloves with a 16-inch gauntlet (at discretion of SSO)
- Nitrile surgical gloves (to be worn underneath outer gloves) (at discretion of SSO)
- Rubber overboots or disposal "booties" (at discretion of SSO)
- Chemically resistant aprons when drilling/sampling in unsaturated zone
- Polycoated tyvek coveralls when drilling/sampling below the water table
- Ear plugs or muffs (at discretion of SSO)

Level C Personal Protective Equipment

- Hard hat
- Full-face respirator with organic vapor/GMC-H combination cartridges
- Steel-toed and steel shank work boots
- Nitrile rubber outer gloves or PVC/nitrile gloves with a 16-inch gauntlet
- Latex surgical gloves (to be worn underneath outer gloves)
- Rubber overboots or disposable "booties"
- Polycoated tyvek coveralls taped at cuffs

Level B Personal Protective Equipment

- Hard hat
- Pressure-demand, full-face self-contained breathing apparatus (SCBA) or pressure-demand supplied air respirator with escape SCBA
- Chemical-resistant coveralls (polycoated tyvek or better), taped at cuffs
- Nitrile rubber outer gloves

- Latex surgical gloves (to be worn underneath outer gloves)
- Rubber overboots or disposable "booties"
- Steel-toed and steel shank work boots

7.1 MEDICAL SURVEILLANCE

Before commencing fieldwork, all personnel must take a medical examination approved by URS and Rohm and Haas health and safety personnel. This requirement is waived for individuals who have taken the examination during the past 12 months.

7.2 HEALTH AND SAFETY TRAINING

All personnel involved in work tasks will have training in chemical hazards, safe operating procedures, and the use of protective clothing and equipment. They are required to participate in an approved 40-hour Health and Safety Training Course and current refresher course in compliance with OSHA Regulation 1910.120 prior to site work. All URS employees and their subcontractors must also receive an initial site safety orientation provided by Rohm and Haas and comply with all plant safety rules.

7.3 COMPLIANCE AGREEMENT FORMS

URS employees and subcontractors will be provided with a copy of the HASP prior to commencement of field work. All employees and subcontractors must read the HASP prior to starting the field work. The URS and Rohm and Haas Site Safety Officers shall hold a meeting with all personnel to be involved with work tasks before work commences. During the meeting, the plan shall be reviewed and discussed, and questions answered. Signed Compliance Agreement forms shall be collected by the Project Manager and filed. Individuals refusing to sign the form will not be allowed to work on the site. A copy of this form is included as Appendix C to this document.

7.4 SAFETY EQUIPMENT REQUIREMENTS

The personal protective equipment (PPE) specified in this Plan will be provided to all URS field personnel. Subcontractors are expected to provide PPE to their field personnel. When air-purifying respirators are required, the wearer must not have facial hair to interfere with the face-to-face piece seal. The wearer must also produce a fit test record and medical clearance verification to wear PPE.

7.5 SITE MANAGER NOTIFICATION

Prior to the commencement of any work tasks at the site, URS personnel must notify Rohm and Haas' safety personnel of his/her presence onsite and obtain a work permit.

7.6 FIELD DOCUMENTATION/PROJECT SAFETY LOG

A daily log will be maintained for field activities to record entry and exit dates and times of all personnel, and of project site visitors, accidents, illnesses, incidence of safety infractions by field personnel, air quality, daily instrument calibration, and personal exposure monitoring data, personal protective equipment worn, and weather conditions. A complete listing of the Rohm and Haas Emergency Phone Contacts is provided in Appendix D. Rohm and Haas' procedures for reporting of illnesses and injuries are provided in Appendix E.

7.7 PROHIBITIONS

Smoking, eating, and drinking shall not be permitted in the plant area work zones.

Rohm and Haas is responsible for site security. URS will establish work zones for work areas that will be instituted and enforced during field activities by the SSO. The work zones, which will be designed to prevent or reduce the migration of potentially contaminated materials and to prevent the entry of unauthorized personnel into URS' work areas, will include, at a minimum, an exclusion zone, a contamination reduction zone, and a support zone. URS will monitor and control access of its personnel into these zones. Rohm and Haas and/or URS will be responsible for controlling other individuals entering into URS' work areas.

Personnel are to be advised that the three-zone approach involves a worst case scenario. In situations involving negligible exposure potential (i.e., mobilization), site zoning procedures will be minimal or inapplicable. In all instances, applicable information will be appropriately communicated to onsite personnel. As previously indicated, no URS employees or subcontractors will be permitted to enter any area where there is a potential for chemical exposure unless they have the appropriate medical clearance and training. Current medical and training documentation will be kept onsite for such personnel to enable the HSER and/or SSO to ensure that unauthorized personnel do not enter a restricted work area. Copies of such documentation will be provided to the Rohm and Haas site remediation supervisor in the advance of work.

The Exclusion Zone is the zone where contamination does or could occur. All persons entering this zone must wear the activity-specific Level of Protection set forth in Section 6.

Exclusion zones will be located at:

- Any area where workers can make contact with contaminated soil, NAPL or contaminated groundwater.
- Any area where air monitoring reveals concentrations of total organic vapors in excess of 1 ppm above background levels.

The exact method specifically chosen to delineate exclusion zone(s) marking will be communicated to personnel during site-specific training. Physically marking the respective exclusion zone(s) also will aid in controlling pedestrian traffic. Exclusion zone areas may change in location and extent as the work progresses or may vary due to changes in wind direction and speed or due to changes in the minimum space requirements for safe and effective work. Also, there may be instances where there will be varying levels of protection in the exclusion zone(s) based upon the tasks to be performed, monitoring instrument readings, or variations in potential exposure, etc. Rationale for such scenarios will be thoroughly explained to onsite personnel.

Contamination Reduction Zones or decon areas will be established adjacent to areas where contact with groundwater or NAPL have occurred. All details concerning the decontamination procedures are included in Section 9.0 of the HASP.

The field activities Support Zone, where support facilities (i.e., trailers, site vehicles, etc.) will be located, will be in a controlled area on the property. Any function that need not or cannot be performed in hazardous or potentially hazardous areas is performed here. This zone will be in an area where contamination is not suspected, and its exact location will be determined prior to initiation of field activities. The storage of any contaminated materials in the support zone will be expressly prohibited.

The SSO will determine the location of URS' site zones prior to commencement of work in any given area. Decision making criteria for each work zone will take into account the following:

- Site historical information.
- Suspected dimensions of the contaminated area.
- Physical and topographical features on the site.
- Weather conditions.
- Access requirements.
- Physical, chemical, toxicological, and other characteristics of the substances present.
- Clean-up activities required.
- Potential for fire.
- Area needed to conduct operations.
- Decontamination procedures. (See Section 9)
- Potential for exposure.

The following decontamination protocols will be used during the field activities.

9.1 DRILLING AND SAMPLING EQUIPMENT

At a minimum, the GeoProbe™ and drilling rigs will be steam cleaned by the subcontractor after completion of all sampling, prior to leaving the Site. If the rig is contaminated during the soils investigation, it shall again be steam cleaned, at the discretion of the URS Geoscientist. Subcontractor personnel will decontaminate the equipment at a designated decontamination station. The decontamination station will be at the Building 8 area, which is constructed on concrete and asphalt and is designed to capture rinsate in a catch basin connected to the chemical sewers on the facility. The subcontractors must provide their own steam cleaner. If gross quantities of soil are present on the equipment, it must be scraped off at the sampling location and contained in drums provided by Rohm and Haas, prior to driving the rig to the Building 8 steam cleaning area. The subcontractor must ensure that no contaminated soil falls from the rig en route to the Building 8 steam cleaning area.

In addition to the rig decontamination procedures discussed above, the following steps will be used to decontaminate any downhole equipment which may cause cross-contamination between sampling locations:

- Personnel will dress in suitable personal protective equipment to reduce exposure as required by the Health and Safety Plan (See the Health and Safety Section of this document).
- Gross quantities of the sampled medium found on equipment will be scraped off at the sampling location and contained in drums to be provided by Rohm and Haas.
- Equipment that will not be damaged by water will be placed in a wash tub containing Alconox or low-sudsing detergent along with potable water and scrubbed with a bristle brush or similar utensil. Equipment will be triple rinsed with tap water in a second wash tub followed by a deionized water rinse. If these methods are not effective in cleaning contamination from downhole equipment, then it must be additionally decontaminated using steam cleaning equipment at the Building 8 decontamination area.
- Equipment that may be damaged by water will be carefully wiped clean using a sponge and detergent water and triple rinsed with tap water. Care will be taken to prevent any equipment damage.

As soil samples are to be collected in dedicated acetate liners, it is anticipated that decontamination of downhole equipment will be at a minimum. However, the URS Site Safety Officer will ensure that the decontamination procedures discussed above are followed when appropriate.

9.2 EQUIPMENT LEAVING THE FACILITY

Vehicles which do not come in contact with potentially contaminated media at the sampling locations shall be cleaned by the subcontractor on an as-needed basis, as determined by the URS Site Safety Officer, using soap and water on the outside portion of the vehicle. As discussed in Section 9.1, onsite cleaning will be required for intrusive equipment and dirty vehicles, which will be leaving the Facility. Onsite construction equipment such as trucks and drill rigs will be

decontaminated onsite before the equipment is removed from the Facility to prevent or minimize exposure of offsite personnel to potential contaminants from the Facility.

All efforts will be made to minimize the generation of decontamination liquids (i.e., water and organic rinses). Pending approval by Rohm and Haas, decontamination liquids will be discharged into the onsite process sewer near Building 8.

9.3 PERSONNEL DECONTAMINATION

A personnel decontamination station will be set up near each boring location prior to the start of drilling activities. The personnel decontamination station will provide space to wash and rinse boots, gloves, and all sampling or measuring equipment prior to exiting the sampling area, and a container to dispose of used disposable items such as gloves, tape or tyvek (if used).

The decontamination procedure for field personnel shall be performed in the following sequence:

- Glove and boot wash in an Alconox and water solution
- Glove and boot water rinse
- Duct tape removal
- Outer glove removal
- Coverall removal
- Respirator removal (if used)
- Inner glove removal

During initial onsite mobilization, the SSO is to coordinate URS' Emergency Response Plan (ERP) with the existing Rohm and Haas ERP. Additionally, the SSO is to ensure that all involved personnel attend appropriate facility training prior to the initiation of work. It is expected that Rohm and Haas will make the appropriate contacts during a site emergency. However, the following ERP provides guidance to URS personnel in the event emergencies that relate to URS operations occur.

10.1 SITE EMERGENCIES

There are several potential emergencies which can arise during remedial activities at the site including:

- Personal injury/illness.
- Incipient stage, non-structural fires (Class A or B).
- Environmental releases and/or spills.

10.1.1 Personal Roles and Lines of Authority

The lines of authority and responsibilities for emergency action coincide with the health and safety responsibilities discussed in this HASP. The SSO shall be responsible for the overall direction and implementation of this ERP and for overall coordination of any emergency response actions. He will notify Rohm and Haas of any emergency situation noted by URS or affiliated with URS activities. Rohm and Haas is responsible for notifying the appropriate outside emergency assistance, as needed. The SSO will designate some type of initial alerting system and will communicate this information during site-specific training and/or an initial toolbox meeting.

10.1.2 Communications/Emergency Information

All supervisory personnel and the SSO will have two-way radio communications if line of sight communications is not possible. The SSO will serve as the focal point for all emergency communications.

Plant telephones will be available for emergency use. Emergency contact phone numbers are provided in Appendix D. Directions to the nearest hospital are provided in Section 10.6 and Figure 4. The SSO is responsible for verifying directions and all telephone numbers upon mobilization.

10.1.3 Buddy System

During all site activities, the buddy system will be required, at least to the point where line-of-sight is maintained with those in the exclusion zone. Personnel must be visible by at least one person while in the exclusion zone, enabling a quick response to any situation that may arise.

10.1.4 Emergency Recognition and Prevention

Compliance with this HASP can assist in the prevention of anticipated site emergencies. These emergency situations can typically be recognized by visual observations, worker complaints or real-time monitoring instrument readings.

10.1.5 Safe Distances, Places of Refuge and Evacuation Routes

Safe distances, places of refuge and evacuation routes are to be determined by the SSO on an emergency-specific basis. Considerations shall include wind direction and site topography. In the event of an evacuation, personnel will attempt to reconvene at a designated safe location for personnel accountability. In the event this area cannot be utilized due to the incident involved, one, far-removed back-up meeting location will be designated during the site-specific training session as an alternate. The alternate evacuation location will be selected by the SSO during mobilization. The location will be used if the proximity of the incident and/or wind direction prevents the use of the primary meeting point.

10.1.6 Site Security and Control

The SSO shall isolate any emergency scene to prevent adverse effects to unprotected or unsuspecting persons.

10.1.7 Response Procedures

The information provided in this subsection is presented as a guideline to assist personnel in safe and effective response to anticipated site emergencies. This information is in no way designed to take the place of reasonable decisions based on incident-specific information. It is expected that URS personnel would only provide minimal or first line response to all emergencies. Local emergency response units would be notified and take over response activities as necessary.

First Priority

Prevent further injury or illness by:

- Protecting response personnel.
- Isolating the scene to authorized personnel only.
- Rescuing the injured parties without additional risk.
- Notifying outside emergency assistance.

Second Priority

Provide first aid/obtain medical treatment for those persons with life threatening injuries or illnesses.

Third Priority

Alleviate the immediate hazards by:

- Extinguishing incipient stage fires.
- Confining any spills.

Fourth Priority

- Provide first aid to those persons with non-life-threatening injuries or illnesses and further efforts to alleviate the hazard.
- All persons with known or suspected chemically related injuries or illnesses shall be immediately examined by a licensed physician.

NOTE: All injuries and/or illnesses no matter how minor are to be immediately reported to the involved individual's supervisor. The supervisor will assess the need for treatment and will contact the HSER for guidance if necessary. The HSER/SSO and/or alternate will evaluate the injured/ill individual's condition and provide first aid treatment as necessary. All procedures instituted will adhere to the guidelines as specified in the American Red Cross training book (or equivalent). If first aid cannot be administered onsite, the individual will be transported to the nearest hospital for evaluation and treatment.

Last Priority

- Complete an incident report, critique the response and prevent recurrence.

10.2 PPE AND EMERGENCY EQUIPMENT

This section provides guidelines for selecting the appropriate PPE and emergency equipment for response to anticipated site emergencies:

Incipient Stage, Non-structural Fires (Class A, B, or C)

- Class A, B, C fire extinguisher. Fire extinguishers will be located in accordance with OSHA standards.
- Approach from upwind side.
- No special PPE required unless fire has moved out of its incipient stage to an uncontrolled burn or if an upwind approach is not possible. In either of these cases, do not attempt to extinguish the flames. Contact appropriate response units by dialing ext. 2500 for Rohm and Haas emergency response.

Personal Injury or Illness

- First-aid kit (located in the site support vehicle and near work area), eyewash station (site support vehicle and near work area).

Spills

- Utilize PPE based upon nature of spill/correlation to monitoring instrument readings. Consult the HSER.

10.3 DECONTAMINATION AND FIRST AID

Decontamination of injured or ill personnel shall consist of removing contaminated clothing. If worker's street clothes are grossly contaminated, remove them to prevent chemical exposure and wrap the injured party in a blanket.

10.4 FOLLOW-UP

Any emergency supplies will be restocked as soon as possible after any incidents, including first aid supplies that may have been exhausted. Reasons for the incident and future preventive measures will be communicated when they become known.

10.5 REPORTING

In the event an incident occurs, two reports must be filed. Both the URS and Rohm and Haas incident reports (Appendix E) will be written by the SSO, with assistance from the HSER. The report shall include the following items; a copy of which shall be provided to Rohm and Haas

- Name, organization, telephone number, and location of the incident.
- Name and title of the person(s) reporting.
- Date and time of incident.
- Location of incident, i.e., site location, facility name.
- Brief summary of incident giving pertinent details including type of operation ongoing at time of incident.
- Cause/nature of incident, if known.
- Casualties.
- Details of any chemical hazard contamination.
- Action taken to ensure safety and security.
- Other damage or injuries sustained (public or private).
- Any reporting to any outside agencies regarding environmental issues (spills, release, etc.) will be the responsibility of Rohm and Haas.

10.6 ROUTE TO HOSPITAL

Frankford Hospital or Northeastern Hospital (Temple) will be used if its services are required. Directions to the hospitals are as follows:

Direction to Frankford Hospital:

1. Exit Plant at the Building 13 Gatehouse, and make a Right onto Bridge Street.
2. Turn left onto Frankford Avenue and proceed approximately two (2) city blocks.
3. Frankford Hospital will be on the right.

Directions to Northeastern Hospital (Temple):

1. From facility out to Richmond Street, turn left.
2. Follow Richmond for approximately 1.2 miles to right on Castor Street.
3. Go 6 blocks on Castor to left on Aramingo Avenue.
4. Go 7 blocks on Aramingo to right to Allegheny Avenue.
5. Northeastern Hospital is down 2 blocks on the right.

Note: A map of the route is included as **Figure 4**

TABLE 2

**SUMMARY OF CONTAMINANTS IN GROUNDWATER,
MAXIMUM CONCENTRATIONS,
AND EXPOSURE LIMITS**

Chemical Compound	CAS #	Maximum Detected Value (mg/L)	2001 TLV (ppm)	ROHM & HAAS Exposure Limits (ppm)
Volatile Organics				
1,1,1-Trichloroethane	71-55-6	0.009	350	100
1,1-Dichloroethane	75-34-3	0.013	100	NA
1,2-Dichloroethane	107-06-2	80.9	10	NA
1,2-Dichloropropane	78-87-5	212	75	25
2-Butanone	78-93-3	0.182	200	NA
2-Hexanone	591-78-6	1.22	5	NA
4-methyl-2-pentanone	108-10-1	82.4	100	NA
Acetone	67-64-1	0.106	500	NA
Benzene	71-43-2	0.826	0.5	1
Carbon Disulfide	75-15-0	1.76	10	NA
Chlorobenzene	108-90-7	85.4	10	NA
Chloroform	67-66-3	36.6	10	NA
Cis-1,2-Dichloroethene	156-59-2	12.2	NA	NA
Ethylbenzene	100-41-4	23.6	100	50
Methylene Chloride	75-09-2	10.6	50	50
Styrene	100-42-5	0.002	20	NA
Tetrachloroethylene	127-18-4	1.42	25	10
Toluene	108-88-3	166	50	50
Trichloroethylene	79-01-6	0.022	50	50
Vinyl Chloride	75-01-4	0.291	5	NA
Xylenes (total)	1330-20-7	129	100	50

Chemical Compound	CAS #	Maximum Detected Value (mg/L)	2001 TLV (ppm)	ROHM & HAAS Exposure Limits (ppm)
Semi-Volatile Organics				
1,2,4-Trichlorobenzene	120-82-1	0.001	NA	NA
1,2-Dichlorobenzene	95-50-1	1.44	25	NA
1,3-Dichlorobenzene	541-73-1	0.002	NA	NA
1,4-Dichlorobenzene	106-46-7	0.88	10	NA
2,4-Dichlorophenol	120-83-2	0.039	NA	NA
2,4-Dimethylphenol	105-67-9	1.13	NA	NA
2-Chlorophenol	95-57-8	0.071	NA	NA
2-Methylnaphthalene	91-57-6	0.066	NA	NA
2-Methylphenol	95-48-7	0.237	5	NA
4-Chloroaniline	106-47-8	0.077	NA	NA
4-Methylphenol	106-44-5	0.003	5	NA
Acenaphthene	83-32-9	0.008	NA	NA
Anthracene	120-12-7	0.006	NA	NA
Acenaphthylene	208-96-8	0.0005	NA	NA
Benzo(a)anthracene	56-55-3	0.006	NA	NA
Benzo(b)fluoranthene	205-99-2	0.006	NA	NA
Bis(2-Chloroethyl) ether	111-44-4	4.94	5	NA
Bis(2-Ethylhexyl) phthalate	117-81-7	0.04	5 mg/m3	NA
Bis(2-Ethylhexyl)phthalate	117-81-7	0.044	NA	NA
Butylbenzylphthalate	85-68-7	0.004	NA	NA
Carbazole	86-74-8	0.017	NA	NA
Chrysene	218-01-9	0.005	NA	NA
Dibenzofuran	132-64-9	0.009	NA	NA
Diethylphthalate	84-66-2	0.002	5 mg/m3	NA
Dimethylphthalate	131-11-3	0.001	5 mg/m3	NA
Di-n-butylphthalate	84-74-2	0.002	5 mg/m3	NA
Di-n-octylphthalate	117-84-0	0.11	NA	NA
Fluoranthene	206-44-0	0.021	NA	NA
Fluorene	86-73-7	0.015	NA	NA
Isophorone	78-59-1	0.014	NA	NA
Naphthalene	91-20-3	0.789	10	NA
Phenanthrene	85-01-8	0.026	NA	NA
Phenol	108-95-2	0.035	5 mg/m3	NA
Pyrene	129-00-0	0.015	NA	NA

Chemical Compound	CAS #	Maximum Detected Value (mg/L)	2001 TLV (ppm)	ROHM & HAAS Exposure Limits (ppm)
PEST/PCB				
4,4'-DDD	72-54-8	0.13	NA	NA
4,4'-DDE	72-55-9	0.034	NA	NA
4,4'-DDT	50-29-3	0.021	NA	NA
Alpha-BHC	319-84-6	0.015	NA	NA
Alpha-Chlordane	5103-71-9	0.002	NA	NA
Beta-BHC	319-85-7	0.001	NA	NA
Delta-BHC	319-86-8	0.0001	NA	NA
Endosulfan I	959-98-8	0.0002	NA	NA
Endrin	72-20-8	0.0001	NA	NA
Gamma-Chlordane	5103-74-2	0.00007	NA	NA
Heptachlor	76-44-8	0.002	NA	NA
Heptachlor epoxide	1024-57-3	0.0009	NA	NA
Inorganics				
Antimony	7440-36-0	1	0.5 mg/m3	NA
Arsenic	7440-38-2	1.75	0.01 mg/m3	0.01 mg/m3
Barium	7440-39-3	1.2	0.5 mg/m3	NA
Beryllium	7440-41-7	0.003	0.002 mg/m3	NA
Cadmium	7440-43-9	0.003	0.01 mg/m3	NA
Chromium (total)	7440-47-3	0.057	0.05 mg/m3	NA
Cobalt	7440-48-4	0.073	0.02 mg/m3	NA
Copper	7440-50-8	0.1	1 mg/m3	NA
Lead	7439-92-1	0.48	0.05 mg/m3	NA
Manganese	7439-96-5	53.3	0.2 mg/m3	NA
Mercury	7439-97-6	0.002	0.025 mg/m3	NA
Nickel	7440-02-0	0.04	0.1 mg/m3	NA
Selenium	7782-49-2	0.027	0.2 mg/m3	NA
Silver	7440-22-4	0.015	0.1 mg/m3	NA
Vanadium	7440-62-2	0.094	0.05 mg/m3	NA
Zinc	7440-66-6	4.37	10 mg/m3	NA

TABLE 3

SUMMARY OF CONTAMINANTS IN LIGHT NON-AQUEOUS PHASE LIQUID (LNAPL),MAXIMUM CONCENTRATIONS, AND EXPOSURE LIMITS

Chemical Compound	CAS #	Maximum Detected Value (mg/L)	2001 TLV (ppm)	ROHM & HAAS Exposure Limits (ppm)
Volatile Organics				
Ethylbenzene	100-41-4	43,000	100	50
Toluene	108-88-3	67,000	50	50
Xylenes (total)	1330-20-7	170,000	100	50
Semi-volatiles				
Naphthalene	91-20-3	2,300	10	NA
2-Methylnaphthalene	NA	450	NA	NA
PESTICIDES				
Endronaldehyde	NA	0.24	NA	NA
Methoxychlor	72-43-5	3	10 mg/m3	NA
4,4'-DDE	NA	0.94	NA	NA
4,4'-DDD	NA	0.2	NA	NA
MISCELLANEOUS ORGANICS				
2-Octanol	NA	30,000	NA	NA
2-Octanone	NA	110,000	NA	NA

Chemical Compound	CAS #	**Maximum Detected Value (mg/L)**	**2001 TLV (ppm)**	ROHM & HAAS **Exposure Limits (ppm)**
Tentatively Identified Compounds				
Cycloalkanes	NA	42,000	NA	NA
Coeluting Aromatics	NA	9,800	NA	NA
Unknown Alaline	NA	12,000	NA	NA
Tetrmethylbenzene isomer	NA	9,900	NA	NA
Ethyldimethylbenzene isomer	NA	9,500	NA	NA

CAS – Chemical Abstract Service Number
TLV – Threshold Limit Value (Time Weighted Average)
NA – Not Assigned or Not Applicable

TABLE 4

SUMMARY OF CONTAMINANTS IN DENSE NON-AQUEOUS PHASE LIQUID (DNAPL),MAXIMUM CONCENTRATIONS, AND EXPOSURE LIMITS

Chemical Compound	CAS #	Maximum Detected Value (mg/L)	2001 TLV (ppm)	ROHM & HAAS Exposure Limits (ppm)
Volatile Organics				
Chlorobenzene	108-90-7	339,000	10	NA
1,2-Dichloroethane	107-06-2	23,800	10	NA
Ethylbenzene	100-41-4	45,200	100	50
Toluene	108-88-3	BMDL	50	50
Xylenes (total)	1330-20-7	BMDL	100	50
Base/Neutral Extractables				
Bis(2-ethylhexyl)phthalate	117-81-7	BMDL	5 mg/m3	NA
1,2-Dichlorobenzene	95-50-1	5,270	25	NA
1,4-Dichlorobenzene	106-46-7	11,800	10	NA
1,2,4-Trichlorobenzene	120-82-1	BMDL	C 5	NA
PESTICIDES				
4,4'-DDT	NA	22,800	NA	NA
4,4'-DDE	NA	18,900	NA	NA
4,4'-DDD	NA	111,000	NA	NA

Chemical Compound	CAS #	Maximum Detected Value (mg/L)	2001 TLV (ppm)	ROHM & HAAS Exposure Limits (ppm)
METALS				
Antimony	7440-36-0	BMDL	0.5 mg/m3	NA
Arsenic	7440-38-2	0.110	0.01 mg/m3	0.01 MG/M3
Chromium	7440-47-3	BMDL	0.01 mg/m3	NA
Copper	7440-50-8	0.230	1 mg/m3	NA
Lead	7439-92-1	BMDL	0.05 mg/m3	NA
Mercury	7439-97-6	0.120	0.025 mg/m3	NA
Nickel	7440-02-0	BMDL	0.02 mg/m3	NA
Zinc	1314-13-2	0.110	10 mg/m3	NA

CAS – Chemical Abstract Service Number
TLV – Threshold Limit Value (Time Weighted Average)
BMDL –Below Method Detection Limit
NA – Not Assigned or Not Applicable

TABLE 5

POTENTIAL PHYSICAL HAZARDS
ROHM and HAAS PHILADELPHIA PLANT

Hazard	Description	Activity	Location	Procedures Used to Monitor/Reduce Hazard
Vehicular Traffic	Trucks Automobiles	All	Throughout site	Be aware of traffic patterns; hard hats, safety shoes, and eye protection, and required site PPE worn during sampling.
Fire/Explosion Hazards	Accumulation of Vapors	All	Throughout site	Allow vapors to dissipate from well headspace before sampling.
Falling	Wet/Slippery Floor Inappropriate access to equipment above floor level	All	Throughout site	Employ general house-keeping tasks.

A more detailed Hazard Analysis Matrix is provided in Table 1 of the text. Please refer to Table 1 for additional information

SCALE: 1 INCH=200 FEET

200' 0 200'

LEGEND:

- TW-15S — EXISTING FACILITY WELL OR PIEZOMETER
- IW-102 — GMS RECOVERY WELLS
- RAILROAD TRACKS
- FENCE LINE
- GROUNDWATER RECOVERY TRENCH

INLET

FRANKFORD

DELAWARE RIVER

N

DORSEY PARK

PARKING LOT

BRILL STREET

BRIDGE STREET

RICHMOND STREET

GARDEN STREET

ALMOND ST.

HOCKEY RINK

BOY'S CLUB

STORAGE TRAILERS

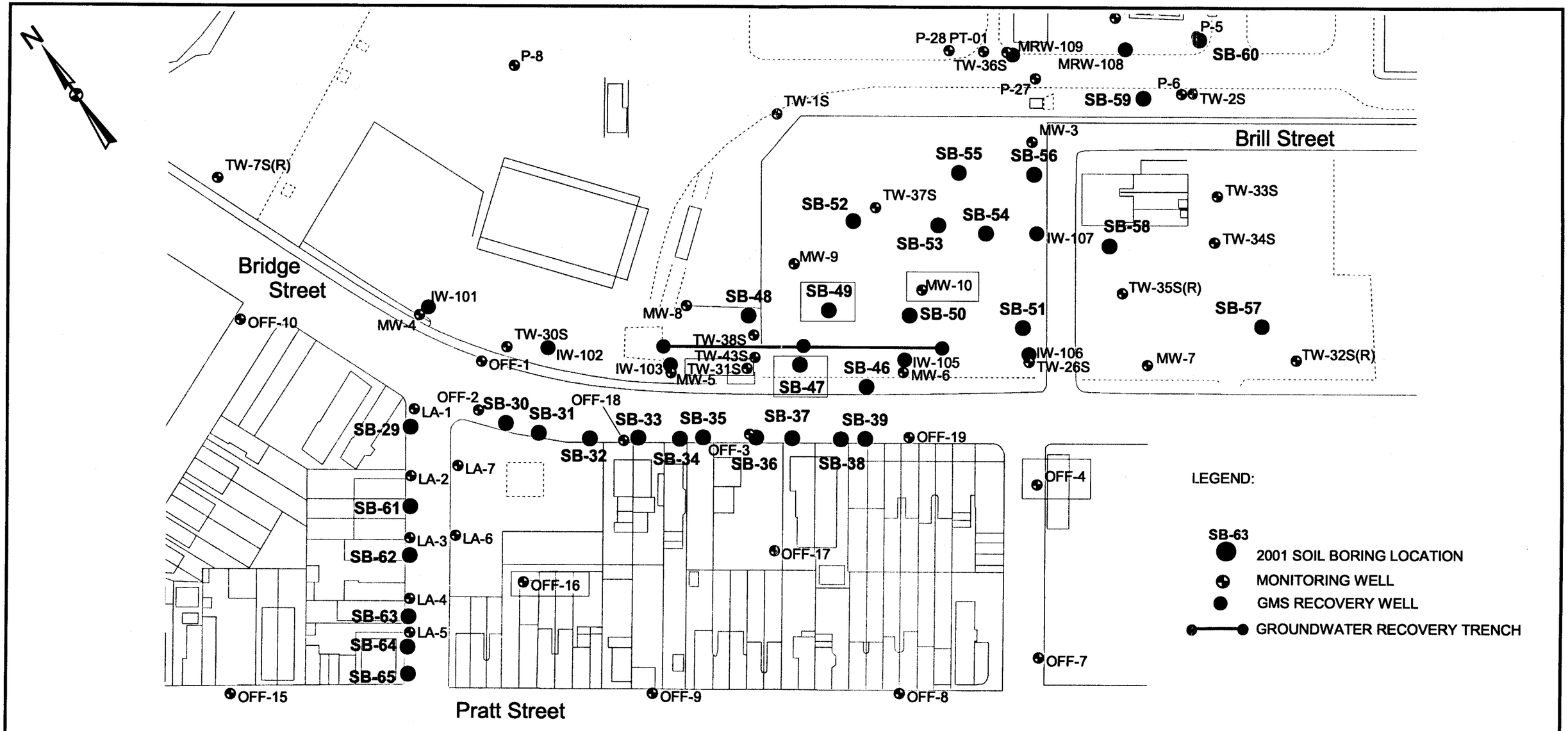
OIL STORAGE

TURNSTILE

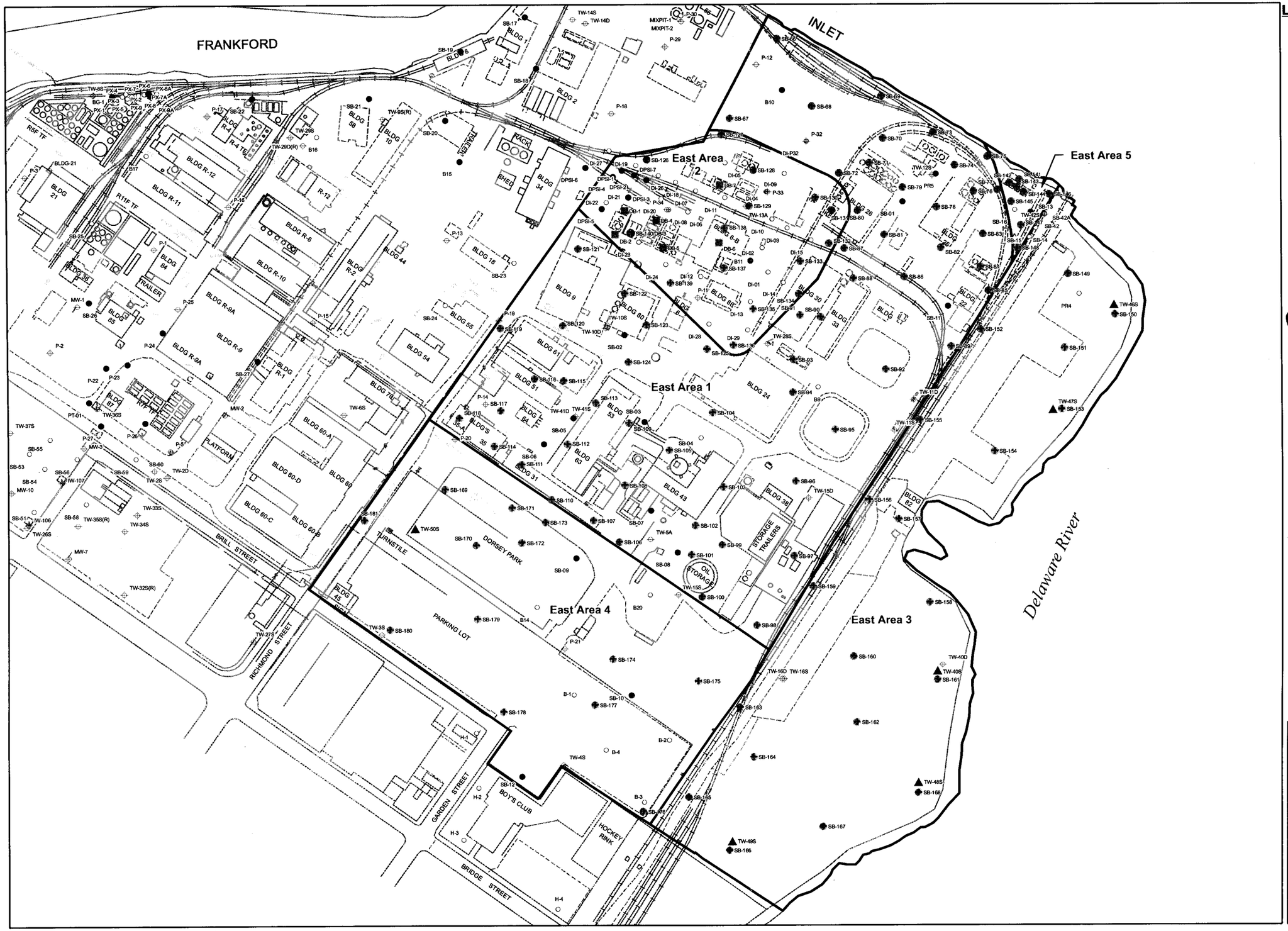
COLLECTION TRENCH

Job.422PHL3532.02	2002 MONITORING WELL LOCATION PLAN ROHM AND HAAS COMPANY, PHILADELPHIA PLANT PHILADELPHIA, PENNSYLVANIA
Prepared by: TP	
Date: 04/15/2002	FIGURE 1

ll.dwg

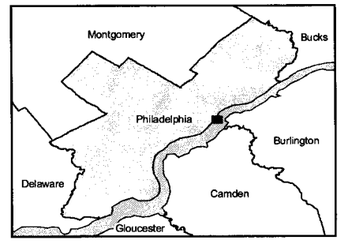


newinapiresidual.apr 421PHL3287	Rohm and Haas Company Philadelphia Plant	SOIL BORING LOCATIONS MARCH 2001 SOILS INVESTIGATION	APR 2002
URS			FIGURE 2



Legend

- ▲ Proposed Monitoring Well
- ● Proposed Shallow Soil Boring
- ■ Proposed Deep Soil Boring
- ● Proposed Shallow & Deep Soil Boring
- ⟡ Groundwater Well
- ● Existing Location Where Database Sample Exceeds State Wide Soils Direct Contact Non-Residential 0-2 Feet
- ● Existing Location Where Database Sample Does Not Exceed State Wide Soils Direct Contact Non-Residential 0-2 Feet
- ○ Existing Location Where No Sample Collected at Depth Interval Specified
- Sub-Areas
- Demolished Structures



Key Map
Not to Scale

N

NAD 1983 StatePlane Pennsylvania South
FIPS 3702 Feet
Lambert Conformal Conic
False Easting: 1968500.000000
False Northing: 0.000000
Central Meridian: -77.750000
Standard Parallel 1: 39.933333
Standard Parallel 2: 40.966667
Latitude Of Origin: 39.333333

1 inch equals 180 feet

0 90 180 360 Feet

URS

Figure #3
Proposed Boring/Vapor Point & Well Location Map East Production Area

Rohm and Haas Philadelphia Plant
Philadelphia, PA

Prepared By: RRM III	Checked By: GA/MP
Job: 19997570.00002	Q:\GIS_Data\ROHMHAAS\PHILA\Projects\Proposed Locations Final\Proposed Locations Figure 4.mxd

Directions to Frankford & Northeastern Hospital

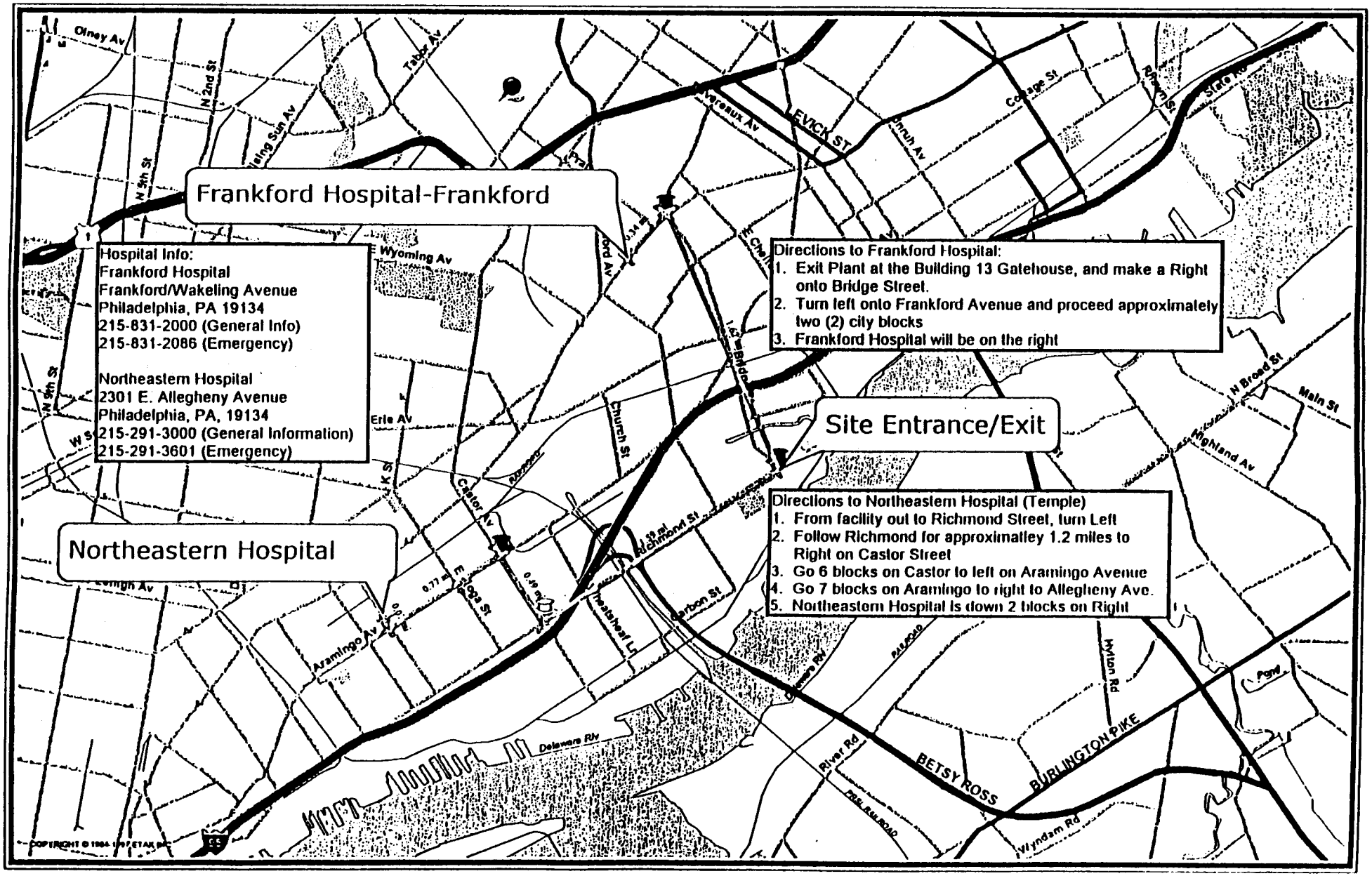


FIGURE 4

Appendix A
Material Safety Data Sheets

Material Safety Data Sheet
1,2-Dichloroethane, 99.8+% (GC)

ACC# 96087

Section 1 - Chemical Product and Company Identification

MSDS Name: 1,2-Dichloroethane, 99.8+% (GC)
Catalog Numbers: AC113360000, AC113360010, AC113360025, AC113360250, AC113361000

Synonyms: Ethylene Dichloride; 1,2- Ethylene Dichloride; Glycol Dichloride; Ethane 1,2-Dichloro-.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
107-06-2	1,2-DICHLOROETHANE	>99.8	203-458-1

Hazard Symbols: T F
Risk Phrases: 11 22 36/37/38 45

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colourless. Flash Point: 58 deg F. **Warning! Flammable liquid.** Causes respiratory tract irritation. May cause digestive tract irritation. Irritant. May be harmful if swallowed. May cause central nervous system depression. May cause liver and kidney damage. Causes eye and skin irritation. May cause cancer based on animal studies. Potential cancer hazard.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye: Causes eye irritation. Vapors may cause eye irritation. May cause chemical conjunctivitis and corneal damage.
Skin: Causes skin irritation. May be absorbed through the skin. May cause irritation and dermatitis. May cause cyanosis of the extremities.
Ingestion: May cause central nervous system depression, kidney damage, and liver damage. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause liver and kidney damage. May cause effects similar to those for inhalation exposure. May be harmful if swallowed.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract

irritation. May cause liver and kidney damage. Aspiration may lead to pulmonary edema. Vapors may cause dizziness or suffocation. Can produce delayed pulmonary edema. May cause burning sensation in the chest.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis. May cause liver and kidney damage. Effects may be delayed.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid. DO NOT use mouth-to-mouth respiration.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Firefighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Will burn if involved in a fire. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Flammable Liquid. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. May polymerize explosively when involved in a fire.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before

reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Use with adequate ventilation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,2-DICHLOROETHANE	10 ppm	1 ppm TWA; 4 mg/m3 TWA; NIOSH Potential Occupational Carcinogen - see Appendix A ; see Appendix C (Chloroethanes) for supplementary exposure limits Potential NIOSH carcinogen.	

OSHA Vacated PELs: 1,2-DICHLOROETHANE: 1 ppm TWA; 4 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colourless
Odor: chloroform-like
pH: Not available.
Vapor Pressure: 66 mm Hg @ 20 C
Vapor Density: 3.5 (Air=1)
Evaporation Rate:0.3 (Butyl acetate=1)
Viscosity: Not available.
Boiling Point: 181 deg F
Freezing/Melting Point:-31.9 deg F
Decomposition Temperature: Not available.
Autoignition Temperature: 775 deg F (412.78 deg C)
Flash Point: 58 deg F (14.44 deg C)

NFPA Rating: (estimated) Health: 2; Flammability: 3; Reactivity: 0
Explosion Limits, Lower:6.2
Upper: 15.9
Solubility: Silghtly soluble in water
Specific Gravity/Density:1.26 (Water=1)
Molecular Formula:C2H4Cl2
Molecular Weight:98.934

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat, electrical sparks.
Incompatibilities with Other Materials: Aluminum, bases, alkali metals, ketones, organic peroxides, nitric acid, strong oxidizing agents, strong reducing agents, liquid ammonia.
Hazardous Decomposition Products: Hydrogen chloride, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 107-06-2: KI0525000
LD50/LC50:
CAS# 107-06-2:
Inhalation, rat: LC50 =1000 ppm/7H;
Oral, mouse: LD50 = 413 mg/kg;
Oral, rabbit: LD50 = 860 mg/kg;
Oral, rat: LD50 = 670 mg/kg;
Skin, rabbit: LD50 = 2800 mg/kg;
Carcinogenicity:
CAS# 107-06-2:
ACGIH: A4 - Not Classifiable as a Human Carcinogen
California: carcinogen; initial date 10/1/87
NIOSH: occupational carcinogen
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2B carcinogen
Epidemiology: IARC Group 2B: Proven animal carcinogenic substance of pote ntial relevance to humans. IARC Group 2B: No data availa ble on human carcinogenicity, however sufficient evi dence of carcinogenicity in animals.
Teratogenicity: May cause decreased fertility and other adverse effects in pregnant female rats and the progeny of the first generation, but not of the second, by giving them repeated 4-hr/day exposures to 57 mg/m3. Death, Ihl-rat, TCLo=20100 ug/m3/1H (female 7-14D post); Stunted fetus, Oral-rat, TDLo=1260 mg/kg (6-15D preg) Developmental abnormalities: Craniofacial, Ihl-mouse, TCLo=100 ppm/7H (female 6-15D post); Musculoskeletal, Oral-rat, TDLo=1260 mg/kg (6-15D preg)
Reproductive Effects: No information found.
Neurotoxicity: No information found.
Mutagenicity: No information found.
Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: Not available.
Environmental Fate: Terrestrial: Smaller releases on land will evaporate fairly rapidly. Larger releases may leach rapidly through sandy soil into groundwater. Aqutic: If released to surface water, its primary loss will be by evaporation. The half-life for evaporation will depend on wind and mixing conditions and was of the order of hours in the laboratory. However a modeling study using the EXAMS model for a eutrophic lake gave a half-life of 10 days. Atmospheric: Will degrade by reaction with hydroxyl radicals formed photochemically in the atmosphere. Half-life over one month.
Physical/Chemical: Not expected to biodegrade or bioconcentrate.
Other: For more information, see "HANDBOOK OF ENVIRONMENTAL FATE AND EXPOSURE DATA."

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 107-06-2: waste number U077.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	ETHYLENE DICHLORIDE-POISON				ETHYLENE DICHLORIDE
Hazard Class:	3				3(6.1)(9.2)
UN Number:	UN1184				UN1184
Packing Group:	II				II
Additional Info:					FLASHPOINT -10 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 107-06-2 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 107-06-2: Effective Date: June 1, 1987; Sunset Date: June 1, 1997
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

Section 302 (RQ)
CAS# 107-06-2: final RQ = 100 pounds (45.4 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 107-06-2: acute, chronic, flammable.
Section 313
This material contains 1,2-DICHLOROETHANE (CAS# 107-06-2, 99 8%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 107-06-2 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 107-06-2 is listed as a Hazardous Substance under the CWA. CAS# 107-06-2 is listed as a Priority Pollutant under the Clean Water Act. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 107-06-2 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act: WARNING: This product contains 1,2-DICHLOROETHANE, a chemical known to the state of California to cause cancer. California No Significant Risk Level: CAS# 107-06-2: no significant risk level = 10 ug/day **European/International Regulations**
European Labeling in Accordance with EC Directives
Hazard Symbols:
T F
Risk Phrases:
R 11 Highly flammable. R 22 Harmful if swallowed. R 36/37/38 Irritating to eyes, respiratory system and skin. R 45 May cause cancer.
Safety Phrases:
S 16 Keep away from sources of ignition - No smoking. S 33 Take precautionary measures against static discharges. S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S 53 Avoid exposure - obtain special instructions before use. S 9 Keep container in a well-ventilated place.
WGK (Water Danger/Protection)
CAS# 107-06-2: 3
Canada
CAS# 107-06-2 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of B2, D2B, D2A.
CAS# 107-06-2 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 107-06-2: OEL-ARAB Republic of Egypt:TWA 5 ppm (2 mg/m3) OEL-AUSTRALIA:TWA 10 ppm (40 mg/m3) OEL-AUSTRIA:TWA 20 ppm (80 mg/m3) OEL-BELGIUM:TWA 10 ppm (40 mg/m3) OEL-DENMARK:TWA 1 ppm (4 mg/m3);Skin OEL-FINLAND:TWA 10 ppm (40 mg/m3);STEL 20 ppm (80 mg/m3);CAR OEL-FRANCE:TWA 10 ppm (40 mg/m3) OEL-GERMANY;Carcinogen OEL-HUNGARY:STEL 4 mg/m3;Carcinogen OEL-JAPAN:TWA 10 ppm (40 mg/m3) OEL-THE NETHERLANDS:TWA 50 ppm (200 mg/m3) OEL-THE PHILIPPINES:TWA 50 ppm (200 mg/m3) OEL-RUSSIA:TWA 10 ppm OEL-SWEDEN:TWA 1 ppm (4 mg/m3);STEL 5 ppm (20 mg/m3);Skin;CAR OEL-SWITZERLAND:TWA 10 ppm (40 mg/m3);STEL 20 ppm (80 mg

/m3) OEL-TURKEY:TWA 50 ppm (200 mg/m3) OEL-UNITED KINGDOM:TWA 10 ppm (40 mg/m3);STEL 15 ppm (60 mg/m3) OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check A CGI TLV

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #4 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet
1,2-Dichloropropane, 98%

ACC# 02091

Section 1 - Chemical Product and Company Identification

MSDS Name: 1,2-Dichloropropane, 98%
Catalog Numbers: AC113670000, AC113670010, AC113670025, AC113670050, AC113670500, AC113672500 AC113672500
Synonyms: Propylene Dichloride
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
78-87-5	1,2-Dichloropropane	98.0	201-152-2

Hazard Symbols: XN F
Risk Phrases: 11 20/22

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colourless. Flash Point: 21 deg C. **Warning! Flammable liquid.** May be harmful if swallowed. May cause central nervous system depression. May be absorbed through the skin. May cause cardiac disturbances. May cause liver and kidney damage. Causes eye and skin irritation. Causes digestive and respiratory tract irritation. May cause blood abnormalities.
Target Organs: Blood, kidneys, heart, central nervous system, liver.

Potential Health Effects

Eye: Causes moderate eye irritation. Vapors cause eye irritation. May cause eye injury.
Skin: Causes skin irritation. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. May be absorbed through the skin.
Ingestion: May be harmful if swallowed. May cause effects similar to those of acute inhalation. Causes gastrointestinal tract irritation.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause liver and kidney damage. May cause anemia. Vapors may cause dizziness or suffocation. May cause cardiac abnormalities. Symptoms of inhalation include: anorexia, abdominal pain, vomiting, blood abnormalities, and hematuria.
Chronic: Chronic inhalation and ingestion may cause effects similar to those of acute inhalation and ingestion.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Firefighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Flammable Liquid. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use only in a well-ventilated area. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,2-Dichloropropane	75 ppm; 110 ppm STEL	NIOSH Potential Occupational Carcinogen - see Appendix A Potential NIOSH carcinogen.	75 ppm TWA; 350 mg/m3 TWA

OSHA Vacated PELs: 1,2-Dichloropropane: 75 ppm TWA; 350 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colourless
Odor: Sweet
pH: Not available.
Vapor Pressure: 50 mm Hg @ 25 deg C
Vapor Density: 3.9
Evaporation Rate:>1 (Butyl Acetate = 1)
Viscosity: Not available.
Boiling Point: 95 - 96 deg C @ 760.00mm Hg
Freezing/Melting Point:-100 deg C
Decomposition Temperature: Not available.
Autoignition Temperature: 557 deg C (1,034.60 deg F)
Flash Point: 21 deg C (69.80 deg F)
NFPA Rating: (estimated) Health: 2; Flammability: 3; Reactivity: 0
Explosion Limits, Lower:3.40 vol %
Upper: 14.50 vol %
Solubility: IN WATER: 3 G/L (20°C)
Specific Gravity/Density:1.1560g/cm3
Molecular Formula:C3H6Cl2
Molecular Weight:112.99

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.

Incompatibilities with Other Materials: Oxidizing agents, acids, , aluminum, orthodichlorobenzene + ethylene dichloride + aluminum. Will attack some forms of plastic, rubber, and coatings.
Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 78-87-5: TX9625000
LD50/LC50:
CAS# 78-87-5:
Inhalation, rat: LC50 =14 gm/m3/8H;
Oral, mouse: LD50 = 860 mg/kg;
Oral, rat: LD50 = 1947 mg/kg;
Skin, rabbit: LD50 = 8750 mg/kg;
Carcinogenicity:
CAS# 78-87-5:
ACGIH: A4 - Not Classifiable as a Human Carcinogen
California: carcinogen; initial date 1/1/90
NIOSH: occupational carcinogen
IARC: Group 3 carcinogen
Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: orl-mus TDL0: 130 gm/kg/2Y-I
Neurotoxicity: No information available.
Mutagenicity: mmo-sat 100 µg/platemma-mus: lym 11600 µg/lcyt-ham: ovr 660 mg/lsce-ham: ovr 113 mg/lsce-ham: lng 3300 µmol/lSee also Dictionary of Substances and Their Effects 1992.
Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: See also Dictionary of Substances and Their Effects.
Environmental Fate: Terrestrial: If released on soil 1,2-dichloropropane will rapidly volatilize and readily leach into the ground especially in sandy soils. Aquatic: Will be lost primarily by volatilization (half-life 5-8 hrs in a typical river to 10 days in a lake). Atmospheric: Will degrade by reaction with photochemically produced hydroxyl radicals (half-life >23 days). Slow biodegradation and bioconcentration.
Physical/Chemical: Not available.
Other: Not available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.

RCRA U-Series: CAS# 78-87-5: waste number U083.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	1,2-DICHLOROPROPANE				PROPYLENE DICHLORIDE
Hazard Class:	3				3(9.2)
UN Number:	UN1279				UN1279
Packing Group:	II				II
Additional Info:					FLASHPOINT 15 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 78-87-5 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 78-87-5: Effective Date: October 4, 1982; Sunset Date: October 4, 1992
Chemical Test Rules
CAS# 78-87-5: Testing required by: manufacturers; processors (40 CFR 799.15
Section 12b
CAS# 78-87-5: 4a/12b/4 term
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

Section 302 (RQ)
CAS# 78-87-5: final RQ = 1000 pounds (454 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 78-87-5: acute, chronic, flammable.
Section 313
This material contains 1,2-Dichloropropane (CAS# 78-87-5, 98 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 78-87-5 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 78-87-5 is listed as a Hazardous Substance under the CWA. CAS# 78-87-5 is listed as a Priority Pollutant under the Clean Water Act. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 78-87-5 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act: WARNING: This product contains 1,2-Dichloropropane, a chemical known

to the state of California to cause cancer. California No Significant Risk Level: None of the chemicals in this product are listed. **European/International Regulations**

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN F

Risk Phrases:

R 11 Highly flammable. R 20/22 Harmful by inhalation and if swallowed.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking. S 24 Avoid contact with skin.

WGK (Water Danger/Protection)

CAS# 78-87-5: 3

Canada

CAS# 78-87-5 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of B2, D2B.
CAS# 78-87-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 78-87-5: OEL-AUSTRALIA:TWA 75 ppm (350 mg/m3);STEL 110 ppm (510 mg/m3) OEL-AUSTRIA:TWA 75 ppm (350 mg/m3) OEL-BELGIUM:TWA 75 ppm (3 47 mg/m3);STEL 110 ppm (509 mg/m3) OEL-DENMARK:TWA 75 ppm (350 mg/m3) OEL-FINLAND:TWA 75 ppm (350 mg/m3);STEL 115 ppm (530 mg/m3) OEL-FRA NCE:TWA 75 ppm (350 mg/m3) OEL-GERMANY:TWA 75 ppm (350 mg/m3) OEL-HU NGARY:TWA 50 mg/m3;STEL 100 mg/m3;Skin JAN9 OEL-THE NETHERLANDS:TWA 7 5 ppm (350 mg/m3) OEL-THE PHILIPPINES:TWA 75 ppm (350 mg/m3) OEL-POL AND:TWA 50 mg/m3 OEL-RUSSIA:STEL 10 mg/m3 OEL-SWITZERLAND:TWA 75 ppm (350 mg/m3);STEL 375 ppm (1750 mg/m3) OEL-TURKEY:TWA 74 ppm (350 mg/ m3) OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 2/17/1999
Revision #2 Date: 8/02/2000

MATERIAL SAFETY DATA SHEET
Rohm and Haas Company

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

4-Methyl-2-Pentanone

Product Code	:	80615	MSDS Date	:	01/29/96
Key	:	908216-4			

Italics **denote a revision from previous MSDS.**

COMPANY IDENTIFICATION	EMERGENCY TELEPHONE NUMBERS
Rohm and Haas Company 100 Independence Mall West Philadelphia, Pa 19106-2399	HEALTH EMERGENCY : 215-592-3000 SPILL EMERGENCY : 215-592-3000 CHEMTREC : 800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

No		CAS REG NO	WEIGHT (%)
1	*Methyl Isobutyl Ketone*	*108-10-1*	*>99*

See Section 8, Exposure Controls / Personal Protection

3. HAZARDS IDENTIFICATION

Primary Routes of Exposure

Inhalation
Ingestion
Skin Contact
Eye Contact

Inhalation

Inhalation of vapor or mist can cause the following:
- irritation of nose, throat, and lungs - headache - nausea - dizziness - drowsiness - loss of coordination - light headedness - unconsciousness - coma in severe exposures

Eye Contact

Material can cause the following:
- severe irritation - tearing - blurring of vision

Skin Contact

Material can cause the following:
- moderate skin irritation - defatting - drying - dermatitis

Ingestion

Material can cause the following:
- gastrointestinal irritation - nausea - vomiting - diarrhea - headache - dizziness - central nervous system depression - unconsciousness - coma - death

Delayed Effects

Methyl isobutyl ketone (MIBK) can cause central nervous system (CNS) effects.

Medical Conditions Aggravated by Overexposure

Pre-existing eye, skin and upper respiratory disorders

4. FIRST AID MEASURES

Inhalation

Move subject to fresh air. If breathing is difficult, give oxygen. Give artificial respiration if breathing has stopped. Get prompt medical attention.

Eye Contact

Flush eyes with a large amount of water for at least 15 minutes. See a physician.

Skin Contact

Remove contaminated clothing. Wash affected skin areas thoroughly with soap and water. See a physician. Wash contaminated clothing thoroughly before reuse. Do not take clothing home to be laundered.

Ingestion

DO NOT induce vomiting. Give milk or water to drink. See a physician. If vomiting occurs spontaneously, keep airway clear. Never give anything by mouth to an unconscious person.

5. FIRE FIGHTING MEASURES

Flash Point	*16°C/61°F Tag Closed Cup*
Auto-ignition Temperature	*475°C/887°F*
Lower Explosive Limit	*1.4%*
Upper Explosive Limit	*7.5%*

Unusual Hazards

Vapors are heavier than air.
Vapors can travel to a source of ignition and flash back.
Combustion generates toxic fumes of the following:
- carbon oxides - hydrocarbons

Extinguishing Agents

Use the following extinguishing media when fighting fires involving this material:
- polar solvent (alcohol) foam - carbon dioxide - dry chemical - water spray

Personal Protective Equipment

Wear self-contained breathing apparatus (pressure-demand MSHA/NIOSH approved or equivalent) and full protective gear.

Special Procedures

DO NOT breathe fumes. Apply water cautiously from a distance. Use water spray to cool containers exposed to fire. Remain upwind. Avoid breathing smoke.

6. ACCIDENTAL RELEASE MEASURES

Personal Protection

Wear a MSHA/NIOSH approved (or equivalent) full-facepiece airline respirator in the positive pressure mode.
Remove all contaminated clothing promptly. Wash all exposed skin areas with soap and water immediately after exposure. Wear full protective equipment including: acid-resistant clothing, gloves and boots, chemical splash goggles and face shield (ANSI Z-87.1 or approved equivalent).
For further information see SECTION 8, Exposure Controls/Personal Protection.

Procedures

Eliminate all ignition sources including those beyond the immediate spill area. Contain spills immediately with inert materials (e.g. sand, earth). Ventilate the spill area. Keep spectators away. Transfer spilled material to suitable containers for recovery or disposal. Use non-sparking tools for

sweeping up or handling spilled material.
WARNING: KEEP SPILLS AND CLEANING RUNOFFS OUT OF MUNICIPAL SEWERS AND OPEN BODIES OF WATER.

7. HANDLING AND STORAGE

Storage Conditions

Material can burn; limit indoor storage to approved areas equipped with automatic sprinklers. Store away from excessive heat (e.g. steampipes, radiators), from sources of ignition and from reactive materials. Store in a well ventilated area. Store in a dry area. Keep container tightly closed when not in use.

Handling Procedures

Do not handle material near food, feed or drinking water. Ground all containers when transferring material. Wash after handling and shower at end of work period.

Other

CONTAINERS HAZARDOUS WHEN EMPTY. Since emptied containers retain product residue (vapors and/or liquid) follow all MSDS and label warnings even after container is emptied. Improper disposal or re-use of this container may be dangerous and illegal. Refer to applicable local, state and federal regulations. Dispose empty container in a sanitary landfill or by incineration as allowed by state and local authorities. Avoid inhalation of smoke if incinerated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limit Information

No		CAS REG NO	WEIGHT (%)
1	*Methyl Isobutyl Ketone*	*108-10-1*	*>99*

Comp.		ROHM AND HAAS		OSHA		ACGIH	
No.	**Units**	**TWA**	**STEL**	**TWA**	**STEL**	**TWA**	**STEL**
1	*ppm*	*10 Skin*	*20 Skin*	*50*	*75*	*50*	*75*

Respiratory Protection

For airborne concentrations up to 100 times the TWA/TLV's listed in -Exposure Limit Information-, wear a MSHA/NIOSH approved or equivalent) full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

Eye Protection

Use chemical splash goggles and face shield (**ANSI Z87.1** or approved equivalent). Eye protection worn must be compatible with respiratory protection system employed.

Hand Protection

Chemical-resistant gloves should be worn whenever this material is handled.
Glove permeation data does not exist for this material. The following glove(s) should be used for splash protection only:
- Neoprene
Gloves should be removed and replaced immediately if there is any indication of degradation or chemical breakthrough.

Other Protection

Where splashing is possible, full chemically resistant protective clothing (e.g. acid suit) and boots are required.

Engineering Controls (Ventilation)

Use explosion proof local exhaust ventilation with a minimum capture velocity of 100 ft/min. (0.5 m/sec.) at the point of vapor evolution. Refer to the current edition of **Industrial Ventilation: A Manual of Recommended Practice** published by the American Conference of Governmental Industrial Hygienists for information on the design, installation, use, and maintenance of exhaust systems.

Other Protective Equipment

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	*Clear*
Color	*Colorless*
State	*Liquid*
Odor Characteristic	*Pleasant odor*
Viscosity	*< 1.0 CPS @ 20°C/68°F*
Specific Gravity (Water = 1)	*0.800 to 0.803 @ 20°C/68°F*
Vapor Density (Air = 1)	*3.5*
Vapor Pressure	*16 mm Hg @ 20°C/68°F*
Melting Point	*-83°C/-117°F*
Boiling Point	*114° to 117°C/237° to 243°F*
Solubility in Water	*Moderately soluble*
Percent Volatility	*100%*

Evaporation Rate (BAc = 1)	*1.64*

See Section 5, Fire Fighting Measures

10. STABILITY AND REACTIVITY

Instability

This material is considered stable. However, avoid contact with ignition sources (e.g. sparks, open flame, heated surfaces).

Hazardous Decomposition Products

Thermal decomposition may yield the following:
- carbon dioxide - hydrocarbons

Hazardous Polymerization

Product will not undergo polymerization.

Incompatibility

Avoid contact with strong oxidizing agents.

11. TOXICOLOGICAL INFORMATION

Acute Data

Oral LD50 - rat: 2080 mg/kg
Dermal LD50 - rabbit: >20 ml/kg
Inhalation LC50 - mouse: 2000 - <4000 ppm.
Skin Irritation - rabbit: moderate irritation
Eye Irritation - rabbit: severe irritation

12. ECOLOGICAL INFORMATION

No Applicable Data

13. DISPOSAL CONSIDERATIONS

Procedure

For disposal, incinerate this material at a facility that complies with local, state, and federal regulations.
The above recommendation covers disposal of material as supplied.

14. TRANSPORT INFORMATION

US DOT Hazard Class	*Call Distribution Safety if description needed for shipping.*

15. REGULATORY INFORMATION

Workplace Classification

This product is considered hazardous under the OSHA Hazard Communication Standard (29CFR 1910.1200).

This product is a 'controlled product' under the Canadian Workplace Hazardous Materials Information System (WHMIS).

SARA TITLE 3: Section 311/312 Categorizations (40CFR 370)

This product is a hazardous chemical under 29CFR 1910.1200, and is categorized as an immediate and delayed health, and flammability physical hazard.

SARA TITLE 3: Section 313 Information (40CFR 372)

This product contains a chemical which is listed in Section 313 at or above ***de minimis*** *concentrations. The following listed chemicals are present: (Quantity present is found elsewhere on this MSDS.)*
- Methyl isobutyl ketone (108-10-1)

CERCLA Information (40CFR 302.4)

This material is regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) Title III Section 304. This material is or contains chemical(s) listed in 40 CFR Table 302.4 or nondesignated RCRA ICR substance(s). (Nondesignated ICR substances apply to materials that will not be reused.) The Reportable Quantity(s) (RQ) are listed below. Releases in excess of its reportable quantity must be reported to the National Response Center (1-800-424-8802) and to the appropriate state and local emergency response organizations.
Methyl isobutyl ketone (108-10-1) 5000lbs.

Waste Classification

When a decision is made to discard this material as supplied, it is classified as a RCRA hazardous waste, hazardous waste number: U161 (40 CFR 261).

United States

All components of this product are in compliance with the inventory listing requirements of the U.S.

Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

16. OTHER INFORMATION

Rohm and Haas Hazard Rating		Scale
Toxicity	3	4=EXTREME
Fire	3	3=HIGH
Reactivity	0	2=MODERATE
Special	-	1=SLIGHT
		0=INSIGNIFICANT

Ratings are based on Rohm and Haas guidelines, and are intended for internal use.

Supplier Information

Ashland Chemical Co.
Division of Ashland Oil, Inc.
P.O. Box 2219
Columbus, Ohio 43216
Emergency Telephone: (606) 324-1133

Shell Oil Company
Product Safety and Compliance
P.O. Box 4320
Houston, TX 77210
Emergency Telephone: (713) 473-9461

ABBREVIATIONS:

ACGIH = American Conference of Governmental Industrial Hygienists
OSHA = Occupational Safety and Health Administration
TLV = Threshold Limit Value
PEL = Permissible Exposure Limit
TWA = Time Weighted Average
STEL = Short-Term Exposure Limit
BAc = Butyl acetate
Italics denote a revision from previous MSDS in this area.

MATERIAL SAFETY DATA SHEET
Rohm and Haas Company

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Chlorobenzene

Product Code	:	80229	MSDS Date	:	01/13/95
Key	:	907988-2			

Italics **denote a revision from previous MSDS.**

COMPANY IDENTIFICATION	EMERGENCY TELEPHONE NUMBERS
Rohm and Haas Company 100 Independence Mall West Philadelphia, Pa 19106-2399	HEALTH EMERGENCY : 215-592-3000 SPILL EMERGENCY : 215-592-3000 CHEMTREC : 800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

No		CAS REG NO	WEIGHT (%)
1	*Chlorobenzene*	*108-90-7*	*100.00%*

See Section 8, Exposure Controls / Personal Protection

3. HAZARDS IDENTIFICATION

Primary Routes of Exposure

Inhalation
Ingestion
Skin Contact
Eye Contact

Inhalation

Inhalation of vapor or mist can cause the following:
- irritation of nose and throat - headache - dizziness - nausea - loss of coordination

Eye Contact

Material can cause the following:
- slight irritation

Skin Contact

Material can cause the following:
- slight skin irritation
Prolonged or repeated skin contact can cause the following:
- burns

Ingestion

Material is possibly harmful if swallowed.
Material can cause the following:
- gastrointestinal irritation - headache - dizziness - nausea - drunkenness

Delayed Effects

Prolonged or repeated overexposure can cause the following:
- kidney damage - liver damage

4. FIRST AID MEASURES

Inhalation

Move subject to fresh air. Give artificial respiration if breathing has stopped. If breathing is difficult, give oxygen. Call a physician.

Eye Contact

Flush eyes with a large amount of water for at least 15 minutes. Consult a physician if irritation persists.

Skin Contact

Remove contaminated clothing. Wash skin thoroughly with soap and water. Consult a physician if irritation persists. Wash contaminated clothing thoroughly before reuse. Do not take clothing home to be laundered.

Ingestion

DO NOT induce vomiting. Give milk or water to drink. IMMEDIATELY see a physician. If vomiting occurs spontaneously, keep airway clear. Never give anything by mouth to an unconscious person.

Note to Physician

The aromatic hydrocarbon fraction of this material is absorbed into the blood from gastrointestinal tract. Gastric lavage with 5% sodium bicarbonate solution. Follow with olive oil through lavage tube or by mouth. DO NOT give epinephrine.

5. FIRE FIGHTING MEASURES

Flash Point	28°C/82°F Tag Closed Cup
Auto-ignition Temperature	640°C/1184°F
Lower Explosive Limit	1.3%
Upper Explosive Limit	7.1%

Unusual Hazards

Vapors can travel to a source of ignition and flash back.
Combustion generates toxic fumes of the following:
- hydrogen chloride - phosgene gas
Material is NOT soluble in water.

Extinguishing Agents

Use the following extinguishing media when fighting fires involving this material:
- carbon dioxide - dry chemical

Personal Protective Equipment

Wear self-contained breathing apparatus (pressure-demand MSHA/NIOSH approved or equivalent) and full protective gear.

Special Procedures

Minimize exposure. Fight fires from a safe distance. Remain upwind. Avoid breathing smoke. Use water spray to cool containers exposed to fire.

6. ACCIDENTAL RELEASE MEASURES

Personal Protection

Wear a MSHA/NIOSH approved (or equivalent) positive pressure self-contained breathing apparatus or a full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.
Wear full protective equipment including: acid-resistant clothing, gloves and boots, chemical splash goggles and face shield (ANSI Z-87.1 or approved equivalent).
Remove all contaminated clothing promptly. Wash all exposed skin areas with soap and water immediately after exposure.
For further information see SECTION 8, Exposure Controls/Personal Protection.

Procedures

Evacuate the spill area immediately. Eliminate all ignition sources including those beyond the immediate spill area. Contain spills immediately with inert materials (e.g. sand, earth). Ventilate the spill area. Transfer spilled material to suitable containers for recovery or disposal. Use non-sparking tools for sweeping up or handling spilled material.
WARNING: KEEP SPILLS AND CLEANING RUNOFFS OUT OF MUNICIPAL SEWERS AND OPEN BODIES OF WATER.

7. HANDLING AND STORAGE

Storage Conditions

Store in an area isolated from other materials to prevent contamination. Avoid temperature extremes during storage; ambient temperature preferred.
Do not store this material near food, feed or drinking water. Store in a well ventilated area. Material can burn; limit indoor storage to approved areas equipped with automatic sprinklers. Ground all metal containers during storage and handling. Store away from excessive heat (e.g. steampipes, radiators), from sources of ignition and from reactive materials. Store out of direct sunlight in a cool place. Store in a dry area. Keep container tightly closed when not in use.

Handling Procedures

Do not handle material near food, feed or drinking water. Ground all containers when transferring material. Avoid contact with clothing and other combustible materials. Wash after handling and shower at end of work period.

Other

CONTAINERS HAZARDOUS WHEN EMPTY. Since emptied containers retain product residue (vapors and/or liquid) follow all MSDS and label warnings even after container is emptied. Residual vapors in empty containers may explode on ignition. DO NOT cut, drill, grind or weld on or near container. Dispose empty container in a sanitary landfill or by incineration as allowed by state and local authorities. Avoid inhalation of smoke if incinerated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limit Information

No		CAS REG NO	WEIGHT (%)
1	*Chlorobenzene*	*108-90-7*	*100.00%*

Comp.		ROHM AND HAAS		OSHA		ACGIH	
No.	Units	TWA	STEL	TWA	STEL	TWA	STEL
1	*ppm*	*10*	*30*	*75*	*None*	*10*	*None*

Respiratory Protection

A respiratory protection program meeting OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

Up to 5 times the TWA/TLV: Wear a MSHA/NIOSH approved (or equivalent) half-mask, air-purifying respirator.

Up to 100 times the TWA/TLV or Unknown: Wear a MSHA/NIOSH approved (or equivalent) self-contained breathing apparatus in the positive pressure mode,
OR,
MSHA/NIOSH approved (or equivalent) full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

Air-purifying respirators should be equipped with organic vapor cartridges and dust and mist filters.

Eye Protection

*Use chemical splash goggles (**ANSI Z87.1** or approved equivalent). Eye protection worn must be compatible with respiratory protection system employed.*

Hand Protection

The glove(s) listed below provide protection against permeation:
- VITON® Synthetic Rubber (registered Trademark of E.I. du Pont Co.)
Gloves should be removed and replaced immediately if there is any indication of degradation or chemical breakthrough.

Other Protection

Use chemically resistant apron or other impervious clothing to avoid prolonged or repeated skin contact. Where splashing is possible, full chemically resistant protective clothing (e.g. acid suit) and boots are required.

Engineering Controls (Ventilation)

*Use explosion proof local exhaust ventilation with a minimum capture velocity of 100 ft/min. (0.5 m/sec.) at the point of vapor evolution. Refer to the current edition of **Industrial Ventilation: A Manual of Recommended Practice** published by the American Conference of Governmental Industrial Hygienists for information on the design, installation, use, and maintenance of exhaust systems.*

Other Protective Equipment

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	*Clear*
Color	*Colorless*
State	*Liquid*
Odor Characteristic	*Mild odor*
Odor Threshold	*0.2 ppm*
pH	*7.0*
Viscosity	*No Data*
Specific Gravity (Water = 1)	*1.11 @ 20°C/68°F*
Vapor Density (Air = 1)	*3.9*
Vapor Pressure	*11.8 mm Hg @ 20°C/68°F*
Melting Point	*-45°C/-49°F*
Boiling Point	*131°C/268°F*
Solubility in Water	*0.05 % @ 30°C/86°F*
Solubility in Benzene	*Completely soluble*
Percent Volatility	*100%*
Evaporation Rate (BAc = 1)	*1.07*

See Section 5, Fire Fighting Measures

10. STABILITY AND REACTIVITY

Instability

This material is considered stable. However, avoid contact with ignition sources (e.g. sparks, open flame, heated surfaces).

Hazardous Decomposition Products

Thermal decomposition may yield the following:
- hydrogen chloride - phosgene - carbon dioxide - carbon monoxide

Hazardous Polymerization

Product will not undergo hazardous polymerization.

Incompatibility

Avoid contact with the following:
- strong oxidizers - sodium - silver perchlorate

11. TOXICOLOGICAL INFORMATION

Acute Data

Oral LD50 - rat: 2910 mg/kg
Inhalation LC50 - rat: 22000 ppm

12. ECOLOGICAL INFORMATION

Environmental Toxicity

Fish, 96 Hour LC50: 100 ppm

13. DISPOSAL CONSIDERATIONS

Procedure

Incinerate liquid and contaminated solids in accordance with local, state, and federal regulations. The above recommendation covers disposal of material as supplied.

14. TRANSPORT INFORMATION

US DOT Hazard Class	*Call Distribution Safety if description needed for shipping.*

15. REGULATORY INFORMATION

Workplace Classification

This product is considered hazardous under the OSHA Hazard Communication Standard (29CFR 1910.1200).

This product is a 'controlled product' under the Canadian Workplace Hazardous Materials Information System (WHMIS).

SARA TITLE 3: Section 311/312 Categorizations (40CFR 370)

This product is a hazardous chemical under 29CFR 1910.1200, and is categorized as an immediate and delayed health, and flammability physical hazard.

SARA TITLE 3: Section 313 Information (40CFR 372)

This product contains a chemical which is listed in Section 313 at or above ***de minimis***

concentrations. The following listed chemicals are present: (Quantity present is found elsewhere on this MSDS.)
- Chlorobenzene (108-90-7)

CERCLA Information (40CFR 302.4)

This material is regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) Title III Section 304. This material is or contains chemical(s) listed in 40 CFR Table 302.4 or nondesignated RCRA ICR substance(s). (Nondesignated ICR substances apply to materials that will not be reused.) The Reportable Quantity(s) (RQ) are listed below. Releases in excess of its reportable quantity must be reported to the National Response Center (1-800-424-8802) and to the appropriate state and local emergency response organizations.
Chlorobenzene (108-90-7) 100lbs.

Waste Classification

When a decision is made to discard this material as supplied, it is classified as a RCRA hazardous waste, hazardous waste number: U037 (40 CFR 261).

United States

All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

16. OTHER INFORMATION

Rohm and Haas Hazard Rating		Scale
Toxicity	2	4=EXTREME
Fire	3	3=HIGH
Reactivity	0	2=MODERATE
Special	-	1=SLIGHT
		0=INSIGNIFICANT

Ratings are based on Rohm and Haas guidelines, and are intended for internal use.

Supplier Information

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272
Emergency Telephone: (304) 843-1300

ABBREVIATIONS:

ACGIH = American Conference of Governmental Industrial Hygienists
OSHA = Occupational Safety and Health Administration
TLV = Threshold Limit Value
PEL = Permissible Exposure Limit
TWA = Time Weighted Average
STEL = Short-Term Exposure Limit
BAc = Butyl acetate
Italics denote a revision from previous MSDS in this area.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

CHLOROFORM

MSDS Number: C2915 --- *Effective Date: 09/15/98*

1. Product Identification

Synonyms: Trichloromethane; Methyl trichloride; Methane trichloride
CAS No.: 67-66-3
Molecular Weight: 119.38
Chemical Formula: CHCl3
Product Codes:
J.T. Baker: 9174, 9175, 9180, 9181, 9182, 9183, 9184, 9186, 9257
Mallinckrodt: 1473, 2175, 4432, 4434, 4439, 4440, 4441, 4443, 4444, H407, V551

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Chloroform	67-66-3	98 - 100%	Yes
Ethyl Alcohol	64-17-5	0 - 1%	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY AFFECT CENTRAL NERVOUS SYSTEM, CARDIOVASCULAR SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and

duration of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Acts as a relatively potent anesthetic. Irritates respiratory tract and causes central nervous system effects, including headache, drowsiness, dizziness. Exposure to higher concentrations may result in unconsciousness and even death. May cause liver injury and blood disorders. Prolonged exposure may lead to death due to irregular heart beat and kidney and liver disorders.
Ingestion:
Causes severe burning in mouth and throat, pain in the chest and vomiting. Large quantities may cause symptoms similar to inhalation.
Skin Contact:
Causes skin irritation resulting in redness and pain. Removes natural oils. May be absorbed through skin.
Eye Contact:
Vapors causes pain and irritation to eyes. Splashes may cause severe irritation and possible eye damage.

Chronic Exposure:
Prolonged or repeated exposure to vapors may cause damage to the nervous system, the heart and the liver and kidneys. Contact with liquid has defatting effect and may cause chronic irritation of skin with cracking and drying, and corresponding dermatitis. Chloroform is a suspected human carcinogen.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Because kidney and liver effects may be delayed, keep victim under observation for 24 to 48 hr. Administration of fluids may help to prevent kidney failure. Obtain blood glucose, urinalysis, liver function tests, chest x-ray, and monitor cardiac function and fluid/electrolyte status. Monitor liver and kidney function for 4 to 5 days after exposure. Disulfiram, its metabolites, and a high carbohydrate diet appear to protect somewhat against chloroform toxicity. Do not give adrenalin! Tests may show increased bilirubin, ketosis, lowered blood prothombin, and fibrogen.

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5. Fire Fighting Measures

Fire:

Slight fire hazard when exposed to high heat; otherwise, practically not flammable.

Explosion:

Sealed containers may rupture when heated.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Keep in a tightly closed light-resistant container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face,

forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Chloroform odor threshold: 250 mg/m3. The odor threshold only serves as a warning of exposure; not smelling it does not mean you are not being exposed.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Chloroform:
-OSHA Permissible Exposure Limit (PEL):
50 ppm (TWA) Ceiling
-ACGIH Threshold Limit Value (TLV):
10 ppm (TWA), Listed as A3 animal carcinogen
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has poor warning properties.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Characteristic ethereal odor.
Solubility:
0.8g/100g water @ 20C (68F).
Specific Gravity:
1.48 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:

62C (144F)
Melting Point:
-63.5C (-83F)
Vapor Density (Air=1):
4.1
Vapor Pressure (mm Hg):
160 @ 20C (68F)
Evaporation Rate (BuAc=1):
11.6

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. pH decreases on prolonged exposure to light and air due to formation of HCl.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong caustics and chemically active metals such as aluminum, magnesium powder, sodium, or potassium; acetone, fluorine, methanol, sodium methoxide, dinitrogen tetroxide, tert-butoxide, triisopropylphosphine.
Conditions to Avoid:
Light, heat, air and incompatibles.

11. Toxicological Information

Toxicological Data:
Chloroform: oral rat LD50: 908 mg/kg; skin rabbit LD50: > 20 gm/kg; inhalation rat LC50: 47702 mg/m3/4H; irritation data: skin rabbit 10 mg/24H open mild; eye rabbit: 20 mg/24H moderate; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Birth defects have been seen in rats and mice exposed by inhalation of chloroform at concentrations greater than 100 ppm in air. Ingestion of chloroform by pregnant laboratory animals has resulted in fetotoxicity but not birth defects, and only at levels causing severe maternal effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Chloroform (67-66-3)	No	Yes	2B
Ethyl Alcohol (64-17-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material is expected to have a half-life of greater than 30 days.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, CHLOROFORM
Hazard Class: 6.1
UN/NA: UN1888
Packing Group: III
Information reported for product/size: 52L

International (Water, I.M.O.)

Proper Shipping Name: CHLOROFORM
Hazard Class: 6.1
UN/NA: UN1888
Packing Group: III
Information reported for product/size: 52L

International (Air, I.C.A.O.)

Proper Shipping Name: CHLOROFORM

Hazard Class: 6.1
UN/NA: UN1888
Packing Group: III
Information reported for product/size: 52L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Chloroform (67-66-3)	Yes	Yes	Yes	Yes
Ethyl Alcohol (64-17-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Chloroform (67-66-3)	Yes	Yes	No	Yes
Ethyl Alcohol (64-17-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Chloroform (67-66-3)	10	10000	Yes	No
Ethyl Alcohol (64-17-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Chloroform (67-66-3)	10	U044	No
Ethyl Alcohol (64-17-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2Z
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:

DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY AFFECT CENTRAL NERVOUS SYSTEM, CARDIOVASCULAR SYSTEM, LIVER AND KIDNEYS. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

Label Precautions:

Do not breathe vapor.
Do not get in eyes, on skin, or on clothing.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 14.

Disclaimer:

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

MATERIAL SAFETY DATA SHEET
Rohm and Haas Company

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Ethylbenzene

Product Code : 80831
Key : 908334-1
MSDS Date : 02/27/98

Italics **denote a revision from previous MSDS.**

COMPANY IDENTIFICATION	EMERGENCY TELEPHONE NUMBERS
Rohm and Haas Company 100 Independence Mall West Philadelphia, Pa 19106-2399	HEALTH EMERGENCY : 215-592-3000 SPILL EMERGENCY : 215-592-3000 CHEMTREC : 800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

No		CAS REG NO	WEIGHT (%)
1	Ethylbenzene	100-41-4	99.600
2	Benzene	71-43-2	0.200
3	Toluene	108-88-3	0.200

See Section 8, Exposure Controls / Personal Protection

3. HAZARDS IDENTIFICATION

Primary Routes of Exposure

Skin Contact
Dermal Absorption
Eye Contact
Inhalation
Ingestion

Inhalation

Inhalation of vapor or mist can cause the following:
- irritation of nose, throat, and lungs
Inhalation of high solvent vapor or mist concentrations can cause the following:

- anesthetic effects - narcosis

Eye Contact

Direct contact with material can cause the following:
- irritation
Repeated contact at high concentrations can cause the following:
- severe irritation - tearing - pain

Skin Contact

Material can cause the following:
- irritation - skin sensitization
Prolonged or repeated skin contact can cause the following:
- defatting and drying of the skin which can lead to irritation and dermatitis

Ingestion

Material can cause the following:
- gastrointestinal inflammation
Aspiration into the lungs may cause:
- pneumonitis (lung inflammation) - pulmonary edema (fluid in lung tissue and air spaces)

Delayed Effects

Benzene is listed by the National Toxicology Program (NTP) and the International Agency for Research on Cancer (IARC) as a cancer causing agent.
Prolonged or repeated overexposure to toluene can cause the following:
- irritation of the respiratory tract - enlarged liver - kidney effects - cardiac sensitization

4. FIRST AID MEASURES

Inhalation

Move subject to fresh air. If breathing is difficult, give oxygen. Give artificial respiration if breathing has stopped. Call a physician.

Eye Contact

Flush eyes with a large amount of water for at least 15 minutes. See a physician.

Skin Contact

Remove contaminated clothing. Wash affected skin areas thoroughly with soap and water. Do not take clothing home to be laundered. Wash contaminated clothing thoroughly before reuse. See a physician.

Ingestion

DO NOT induce vomiting, petroleum distillate present. Consult a physician. If vomiting occurs spontaneously, keep airway clear. Never give anything by mouth to an unconscious person.

Note to Physician

No specific antidote, treat symptomatically. Petroleum distillate present. Rapid absorption may occur through lungs if aspirated and cause systemic effects. The decision whether to induce vomiting or not

should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach.

5. FIRE FIGHTING MEASURES

Flash Point	15°C/59°F Tag Closed Cup
Auto-ignition Temperature	432°C/810°F
Lower Explosive Limit	1.0%
Upper Explosive Limit	6.7%

Unusual Hazards

Vapors are heavier than air.
Vapors can travel to a source of ignition and flash back.
Material is NOT soluble in water.
Closed containers may rupture via pressure build-up when exposed to fire or extreme heat.
Material can release vapors at or above room temperature that will form flammable or explosive mixtures with air.

Extinguishing Agents

Use the following extinguishing media when fighting fires involving this material:
- carbon dioxide - dry chemical - foam

Personal Protective Equipment

Wear self-contained breathing apparatus (pressure-demand MSHA/NIOSH approved or equivalent) and full protective gear.

Special Procedures

EVACUATE THE AREA of all non-emergency personnel. Fight fires from a safe distance. Minimize exposure. Move containers promptly out of fire zone. If removal is impossible, cool containers with water spray. DO NOT use a solid stream of water. A solid stream of water can spread fire.

6. ACCIDENTAL RELEASE MEASURES

Personal Protection

Wear a MSHA/NIOSH approved (or equivalent) half-mask air-purifying respirator. Equip with organic vapor cartridges and dust and mist filters. Wear compatible, chemically resistant gloves. Wear protective clothing including splash proof goggles and rubber overshoes.

Procedures

Keep spectators away. Eliminate all ignition sources including those beyond the immediate spill area. Contain spills immediately with inert materials (e.g. sand, earth). Ventilate the spill area. Transfer spilled material to suitable containers for recovery or disposal. Avoid all contact. Use non-sparking tools for sweeping up or handling spilled material.
WARNING: KEEP SPILLS AND CLEANING RUNOFFS OUT OF MUNICIPAL SEWERS AND OPEN BODIES OF WATER.

7. HANDLING AND STORAGE

Storage Conditions

The maximum recommended storage temperature for this material is 49C/120F.
Do not store this material near food, feed or drinking water. Store in a well ventilated area.
Material can burn; limit indoor storage to approved areas equipped with automatic sprinklers. Ground all metal containers during storage and handling. Avoid all ignition sources.
Keep container tightly closed when not in use.

Handling Procedures

Do not handle material near food, feed or drinking water. Ground all containers when transferring material. Use non-sparking tools and grounding cables when transferring. Avoid contact with clothing and other combustible materials. Wash after handling and shower at end of work period.

Other

CONTAINERS HAZARDOUS WHEN EMPTY. Since emptied containers retain product residue (vapors and/or liquid) follow all MSDS and label warnings even after container is emptied. Residual vapors in empty containers may explode on ignition. DO NOT cut, drill, grind or weld on or near container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limit Information

No		CAS REG NO	WEIGHT (%)
1	Ethylbenzene	100-41-4	99.600
2	Benzene	71-43-2	0.200
3	Toluene	108-88-3	0.200

Comp.		ROHM AND HAAS		OSHA		ACGIH	
No.	Units	TWA	STEL	TWA	STEL	TWA	STEL
1	ppm	50	75	100	125	100	125
2	ppm	0.5 Skin	2.5 Skin	1 a	5	0.5 Skin	2.5 Skin
3	ppm	50 Skin	75 Skin	100	150	50 Skin	None

a OSHA Specifically Regulated

See -Workplace Classification- in SECTION 15, Regulatory Information, for specific regulation.

Respiratory Protection

Up to 5 times the TWA/TLV: Wear a MSHA/NIOSH approved (or equivalent) half-mask, air-purifying respirator.

Up to 100 times the TWA/TLV or Unknown: Wear a MSHA/NIOSH approved (or equivalent) self-contained breathing apparatus in the positive pressure mode,
OR,
MSHA/NIOSH approved (or equivalent) full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

Air-purifying respirators should be equipped with MSHA/NIOSH approved (or equivalent) cartridges for protection against organic vapors and filters for protection against dusts and mists.

Eye Protection

Use chemical splash goggles (**ANSI Z87.1** or approved equivalent). Eye protection worn must be compatible with respiratory protection system employed.

Hand Protection

Glove permeation data does not exist for this material. The following glove(s) should be used for splash protection only:
- Neoprene
Gloves should be removed and replaced immediately if there is any indication of degradation or chemical breakthrough.
Rinse and remove gloves immediately after use. Wash hands with soap and water.

Other Protection

Use chemically resistant apron or other impervious clothing to avoid prolonged or repeated skin contact.

Engineering Controls (Ventilation)

Use explosion proof local exhaust ventilation with a minimum capture velocity of 150 ft/min. (0.75 m/sec.) at the point of dust or mist evolution. Refer to the current edition of **Industrial Ventilation: A Manual of Recommended Practice** published by the American Conference of Governmental Industrial Hygienists for information on the design, installation, use, and maintenance of exhaust systems.

Other Protective Equipment

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear
Color	Colorless
State	Liquid
Odor Characteristic	Aromatic odor
Odor Threshold	< 1 ppm
pH	Neutral
Viscosity	< 1 CPS @ 20°C/68°F
Specific Gravity (Water = 1)	0.867 @ 20°C/68°F
Vapor Density (Air = 1)	3.66
Vapor Pressure	7.1 mm Hg @ 20°C/68°F
Melting Point	-95°C/-139°F
Boiling Point	136°C/277°F
Solubility in Water	Practically insoluble
Solubility in	Completely soluble
Percent Volatility	100%
Evaporation Rate (BAc = 1)	< 1
Surface tension	29.04 dynes/cm @ 20°C/68°F

See Section 5, Fire Fighting Measures

10. STABILITY AND REACTIVITY

Instability

This material is considered stable. However, avoid contact with ignition sources (e.g. sparks, open flame, heated surfaces).

Hazardous Decomposition Products

Thermal decomposition may yield the following:
- oxides of nitrogen

Hazardous Polymerization

Product will not undergo hazardous polymerization.

Incompatibility

Avoid contact with the following:
- acids - ammonium compounds - bases - oxidizing agents

11. TOXICOLOGICAL INFORMATION

Acute Data

Oral LD50 - rat: 3500 mg/kg
Intraperitoneal LD50 - mouse: 2272 mg/kg
Dermal LD50 - rabbit: 17800 mg/kg

Carcinogenicity Data

This product contains ethylbenzene, which was demonstrated by the US National Toxicology Program to cause increased rat kidney tumors and increased mouse lung and liver tumors upon lifetime inhalation exposure to 750 ppm; these effects were not observed at 250 or 75 ppm ethylbenzene.

12. ECOLOGICAL INFORMATION

No Applicable Data

13. DISPOSAL CONSIDERATIONS

Procedure

Incinerate liquid and contaminated solids in accordance with local, state, and federal regulations. The above recommendation covers disposal of material as supplied.

14. TRANSPORT INFORMATION

US DOT Hazard Class	Call Corporate Logistics if description needed for shipping.

15. REGULATORY INFORMATION

Workplace Classification

This product is considered hazardous under the OSHA Hazard Communication Standard (29CFR 1910.1200). Component 2 is a substance specifically regulated by OSHA in 29 CFR 1910.1028.

This product is a 'controlled product' under the Canadian Workplace Hazardous Materials Information System (WHMIS).

SARA TITLE 3: Section 311/312 Categorizations (40CFR 370)

This product is a hazardous chemical under 29CFR 1910.1200, and is categorized as an immediate and delayed health, and flammability physical hazard.

SARA TITLE 3: Section 313 Information (40CFR 372)

This product contains a chemical which is listed in Section 313 at or above **de minimis** concentrations. The following listed chemicals are present: (Quantity present is found elsewhere on this MSDS.)
- Ethylbenzene (100-41-4)
- Benzene (71-43-2)

CERCLA Information (40CFR 302.4)

This material is regulated under the Comprehensive Environmental Response, Compensation and

Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) Title III Section 304. This material is or contains chemical(s) listed in 40 CFR Table 302.4 or nondesignated RCRA ICR substance(s). (Nondesignated ICR substances apply to materials that will not be reused.) The Reportable Quantity(s) (RQ) are listed below. Releases in excess of its reportable quantity must be reported to the National Response Center (1-800-424-8802) and to the appropriate state and local emergency response organizations.
Ethylbenzene (100-41-4) 1000lbs.
Benzene (71-43-2) 10lbs.

Waste Classification

When a decision is made to discard this material as supplied, it is classified as a RCRA hazardous waste with the characteristic of ignitability, hazardous waste number: D001

United States

All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

California (Proposition 65)

This product contains trace levels of a component or components known to the state of California to cause cancer and birth defects or other reproductive harm:
- Benzene (71-43-2)

This product contains trace levels of a component or components known to the state of California to cause birth defects or other reproductive harm:
- Toluene (108-88-3)

16. OTHER INFORMATION

Rohm and Haas Hazard Rating		Scale
Toxicity	2	4=EXTREME
Fire	3	3=HIGH
Reactivity	0	2=MODERATE
Special	-	1=SLIGHT
		0=INSIGNIFICANT

Ratings are based on Rohm and Haas guidelines, and are intended for internal use.

Supplier Information

Arco Chemical Co.
1500 Market Street
Philadelphia, PA 19101
(215) 353-8300

Coyne Chemical Co.
3015 State Road
Croydon, Pa. 190219135
Telephone: (215) 785-3000

89.00980227

ABBREVIATIONS:

ACGIH = American Conference of Governmental Industrial Hygienists
OSHA = Occupational Safety and Health Administration
TLV = Threshold Limit Value
PEL = Permissible Exposure Limit
TWA = Time Weighted Average
STEL = Short-Term Exposure Limit
BAc = Butyl acetate
Italics denote a revision from previous MSDS in this area.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

METHYLENE CHLORIDE

MSDS Number: M4420 --- *Effective Date: 06/30/98*

1. Product Identification

Synonyms: MC; Dichloromethane (DCM); Methylene dichloride; Methylene bichloride; Methane dichloride
CAS No.: 75-09-2
Molecular Weight: 84.93
Chemical Formula: CH2Cl2
Product Codes: 9264, 9266, 9295, 9315, 9324, 9329, 9330, 9341, 9348, 9350, 9965, Q480

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Methylene Chloride	75-09-2	> 99%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, CARDIOVASCULAR SYSTEM, AND BLOOD. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 1 - Slight
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes formation of carbon monoxide in blood which affects cardiovascular system and central nervous system. Continued exposure may cause increased light-headedness, staggering, unconsciousness, and even death. Exposure may make the symptoms of angina (chest pains) worse.
Ingestion:
May cause irritation of the gastrointestinal tract with vomiting. If vomiting results in aspiration, chemical pneumonia could follow. Absorption through gastrointestinal tract may produce symptoms of central nervous system depression ranging from light headedness to unconsciousness.
Skin Contact:
Causes irritation, redness and pain. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Eye Contact:
Vapors can cause eye irritation. Contact can produce pain, inflammation and temporal eye damage.
Chronic Exposure:
Can cause headache, mental confusion, depression, liver effects, kidney effects, bronchitis, loss of appetite, nausea, lack of balance, and visual disturbances. Can cause dermatitis upon prolonged skin contact. Methylene chloride may cause cancer in humans.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye problems, impaired liver, kidney, respiratory or cardiovascular function may be more susceptible to the effects of this substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by

mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Autoignition temperature: 556C (1033F)
Flammable limits in air % by volume:
lel: 12; uel: 23

Forms flammable vapor-air mixtures above 100C (212F).
Explosion:
Concentrated can be ignited by a high intensity ignition source. Vapor may form flammable mixture in atmosphere that contains a high percentage of oxygen. Sealed containers may rupture when heated.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases. Structural firefighters' clothing provides only limited protection to the combustion products of this material.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Outside or detached storage is recommended. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe

all warnings and precautions listed for the product. To minimize decomposition, all storage containers should be galvanized or lined with a phenolic coating. This material may corrode plastic and rubber. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Odor Threshold: 205 - 307 ppm. The odor threshold only serves as a warning of exposure; not smelling it does not mean you are not being exposed.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Methylene Chloride (Dichloromethane):
- OSHA Permissible Exposure Limit (PEL) -
25 ppm (TWA), 125 ppm (STEL), 12.5 ppm (8-hour TWA - Action Level)
- ACGIH Threshold Limit Value (TLV) -
50 ppm (TWA), A2 - suspected human carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. The cartridges recommended for this material have a predicted service of less than 30 minutes at concentrations of ten times (10x) the exposure limits. Actual service life will vary considerbly, depending on concentration levels, temperature, humidity, and work rate. This substance has poor warning properties.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene is a recommended material for personal protective equipment. Natural rubber and polyvinyl chloride ARE NOT recommended materials for personal protective equipment.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:
Do not use closed circuit rebreathing system employing soda lime or other carbon dioxide absorber because of formation of toxic compounds capable of producing cranial nerve paralysis. See OSHA Standard for medical surveillance, record keeping, and reporting requirements for methylene chloride (29 CFR 1910.1052).

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9. Physical and Chemical Properties

Appearance:

Clear, colorless liquid.
Odor:
Chloroform-like odor.
Solubility:
1.32 gm/100 gm water @ 20C.
Specific Gravity:
1.33 @ 15C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
39.8C (104F)
Melting Point:
-97C (-143F)
Vapor Density (Air=1):
2.9
Vapor Pressure (mm Hg):
350 @ 20C (68F)
Evaporation Rate (BuAc=1):
27.5

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Emits highly toxic fumes of phosgene when heated to decomposition. Decomposes in a flame or hot surface to form toxic gas phosgene and corrosive mists of hydrochloric acid. Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizers, strong caustics, plastics, rubber, nitric acid, water + heat, and chemically active metals, such as aluminum and magnesium powder, sodium, potassium, and lithium. Avoid contact with open flames and electrical arcs. Liquid methylene chloride will attack some forms of plastics, rubber, and coatings.
Conditions to Avoid:
Moisture, heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Toxicological Data:
Dichloromethane: Oral rat LD50: 1600 mg/kg; inhalation rat LC50: 52 gm/m3; investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
Dichloromethane has been linked to spontaneous abortions in humans.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Methylene Chloride (75-09-2)	No	Yes	2B

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of greater than 30 days. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.
Environmental Toxicity:
The LC50/96-hour values for fish are over 100 mg/l. This material is not expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: DICHLOROMETHANE
Hazard Class: 6.1
UN/NA: UN1593
Packing Group: III
Information reported for product/size: 52L

International (Water, I.M.O.)

Proper Shipping Name: DICHLOROMETHANE

Hazard Class: 6.1
UN/NA: UN1593
Packing Group: III
Information reported for product/size: 52L

International (Air, I.C.A.O.)

Proper Shipping Name: DICHLOROMETHANE
Hazard Class: 6.1
UN/NA: UN1593
Packing Group: III
Information reported for product/size: 52L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Methylene Chloride (75-09-2)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Methylene Chloride (75-09-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Methylene Chloride (75-09-2)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Methylene Chloride (75-09-2)	1000	U080	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2Z
Poison Schedule: S5
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **2** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, CARDIOVASCULAR SYSTEM, AND BLOOD. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.
Label Precautions:
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat and flame.
Do not get in eyes, on skin, or on clothing.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 1, 2.
Disclaimer:
****

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****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TOLUENE

MSDS Number: T3913 --- *Effective Date: 11/17/99*

1. Product Identification

Synonyms: Methylbenzene; Toluol; Phenylmethane
CAS No.: 108-88-3
Molecular Weight: 92.14
Chemical Formula: C6H5-CH3
Product Codes:
J.T. Baker: 5375, 5584, 5809, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476

Mallinckrodt: 4483, 8091, 8092, 8604, 8608, 8610, 8611, V560

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Toluene	108-88-3	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM.

CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.
Ingestion:
Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.
Skin Contact:
Causes irritation. May be absorbed through skin.
Eye Contact:
Causes severe eye irritation with redness and pain.
Chronic Exposure:
Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver or kidney function may be more susceptible to the effects of this substance. Alcoholic beverage consumption can enhance the toxic effects of this substance.

---

4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.
Skin Contact:
In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while

removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: 7C (45F) CC
Autoignition temperature: 422C (792F)
Flammable limits in air % by volume:
lel: 3.3; uel: 19
Flammable liquid and vapor!
Dangerous fire hazard when exposed to heat or flame. Vapors can flow along surfaces to distant ignition source and flash back.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles.

Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Toluene:
- OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA); 300 ppm (acceptable ceiling conc.); 500 ppm (maximum conc.).
- ACGIH Threshold Limit Value (TLV):
50 ppm (TWA) skin, A4 - Not Classifiable as a Human Carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Aromatic benzene-like.

Solubility:
0.05 gm/100gm water @ 20C (68F).

Specific Gravity:
0.86 @ 20C / 4 C

pH:
No information found.

% Volatiles by volume @ 21C (70F):
100
Boiling Point:
111C (232F)
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
3.14
Vapor Pressure (mm Hg):
22 @ 20C (68F)
Evaporation Rate (BuAc=1):
2.24

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetraoxide; will attack some forms of plastics, rubber, coatings.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m3/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe. Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Has shown some evidence of reproductive effects in laboratory animals.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Toluene (108-88-3)	No	No	3

---

12. Ecological Information

Environmental Fate:

When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0. Bioconcentration factor = 13.2 (eels).

Environmental Toxicity:

This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

International (Water, I.M.O.)

Proper Shipping Name: TOLUENE
Hazard Class: 3.2
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Toluene (108-88-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Toluene (108-88-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Toluene (108-88-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Toluene (108-88-3)	1000	U220	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 3[Y]E
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Label First Aid:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head below hips to prevent aspiration into lungs. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If

breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician immediately.

Product Use:

Laboratory Reagent.

Revision Information:

No changes.

Disclaimer:

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Prepared by: Strategic Services Division

Phone Number: (314) 539-1600 (U.S.A.)

MATERIAL SAFETY DATA SHEET
Rohm and Haas Company

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Xylene

Product Code	:	81005	MSDS Date	:	09/12/97
Key	:	908455-4			

***Italics* denote a revision from previous MSDS.**

COMPANY IDENTIFICATION	EMERGENCY TELEPHONE NUMBERS
Rohm and Haas Company 100 Independence Mall West Philadelphia, Pa 19106-2399	HEALTH EMERGENCY : 215-592-3000 SPILL EMERGENCY : 215-592-3000 CHEMTREC : 800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

No		CAS REG NO	WEIGHT (%)
1	*Xylene*	*1330-20-7*	*83.000*
2	*Ethylbenzene*	*100-41-4*	*17.000*

See Section 8, Exposure Controls / Personal Protection

3. HAZARDS IDENTIFICATION

Primary Routes of Exposure

Inhalation
Ingestion
Dermal Absorption
Skin Contact
Eye Contact

Inhalation

Inhalation of vapor or mist can cause the following:
- irritation of nose, throat, and lungs - headache - nausea - dizziness - drowsiness - staggering - light headedness - labored breathing
Inhalation of high vapor or mist concentrations can cause the following:

- abdominal pain - pulmonary edema (fluid in lung and air spaces) - unconsciousness - coma - death

Eye Contact

Material can cause the following:
- severe irritation - conjunctivitis

Skin Contact

Material can cause the following:
- slight to moderate skin irritation - defatting - drying - dermatitis - cracking - reddening
Material can be absorbed through intact skin with the appearance of initial symptoms of inhalation exposure.

Ingestion

Material is possibly harmful if swallowed.
Material can cause the following:
- central nervous system depression - drowsiness - tiredness - dizziness - gastrointestinal irritation - nausea - vomiting - diarrhea - pneumonitis (lung inflammation) - pneumonitis (lung inflammation) - pulmonary edema (fluid in lung tissue and air spaces) - lung injury

Delayed Effects

Prolonged or repeated overexposure to xylene can cause the following:
- reversible liver impairment - reversible kidney impairment

Medical Conditions Aggravated by Overexposure

Pre-existing
- kidney disorders - liver disorders - skin disorders - respiratory disorders

4. FIRST AID MEASURES

Inhalation

Move subject to fresh air. If breathing is difficult, give oxygen. Give artificial respiration if breathing has stopped. Get prompt medical attention.

Eye Contact

Flush eyes with a large amount of water for at least 15 minutes. Get prompt medical attention.

Skin Contact

Wash affected skin areas thoroughly with soap and water. Remove and wash contaminated clothing thoroughly. Do not take clothing home to be laundered. Discard contaminated shoes, belts and other articles made of leather. Consult a physician if irritation persists.

Ingestion

If swallowed, give 2 glasses of water to drink. DO NOT induce vomiting, petroleum distillate present. Careful gastric lavage may be indicated. Never give anything by mouth to an unconscious person. If vomiting occurs spontaneously, keep airway clear. IMMEDIATELY see a physician.

Note to Physician

Exposure to xylene can affect the CNS, pulmonary, cardiovascular, and gastrointestinal systems. Liver enzymes, EKG, serum electrolytes, and a chest X-ray should be done in cases of massive exposure.

5. FIRE FIGHTING MEASURES

Flash Point	25° to 27°C/77° to 81°F Tag Closed Cup
Auto-ignition Temperature	466° to 530°C/871° to 986°F
Lower Explosive Limit	1.0%
Upper Explosive Limit	7.0%

Unusual Hazards

Vapors are heavier than air.
Vapors can travel to a source of ignition and flash back.
Material can release vapors at or above room temperature that will form flammable or explosive mixtures with air.
Closed containers may rupture via pressure build-up when exposed to fire or extreme heat.
Combustion generates toxic fumes of the following:
- carbon oxides - hydrocarbons
Material is lighter than water.
Material is NOT soluble in water.

Extinguishing Agents

Use the following extinguishing media when fighting fires involving this material:
- carbon dioxide - dry chemical - foam

Personal Protective Equipment

As in any fire, wear self-contained breathing apparatus (pressure-demand, MSHA/NIOSH approved or equivalent) and full protective gear.

Special Procedures

EXPLOSION HAZARD. Fight advanced fires from a protected location. Use water spray to cool containers exposed to fire. Use water spray to protect personnel. Use water spray in patterns to dilute vapors and wash them from air. Use water spray to change course of run-off. DO NOT permit water to enter containers.

6. ACCIDENTAL RELEASE MEASURES

Personal Protection

Wear a MSHA/NIOSH approved (or equivalent) positive pressure self-contained breathing apparatus or a full-facepiece airline respirator in the positive pressure mode with emergency escape provisions. Equip with organic vapor cartridges. Equip with organic vapor cartridges and dust and mist filters. Wear full protective equipment including: acid-resistant clothing, gloves and boots, chemical splash goggles and face shield (ANSI Z-87.1 or approved equivalent). MATERIAL IS A SEVERE IRRITANT. If

exposed to material during clean-up operations, IMMEDIATELY remove all contaminated clothing and wash exposed skin areas with soap and water. See SECTION 4, First Aid Measures, for further information.

Procedures

Evacuate the spill area immediately. Eliminate all ignition sources including those beyond the immediate spill area. Contain spills immediately with inert materials (e.g. sand, earth). Ventilate the spill area. Transfer liquids and solid diking material to separate suitable containers for recovery or disposal. Avoid all contact. Use non-sparking tools for sweeping up or handling spilled material.
WARNING: KEEP SPILLS AND CLEANING RUNOFFS OUT OF MUNICIPAL SEWERS AND OPEN BODIES OF WATER.

7. HANDLING AND STORAGE

Storage Conditions

Avoid temperature extremes during storage; ambient temperature preferred. Containers should not be in storage for more than 6 months. Store in a well ventilated area. Use monomer within one month. Material is unstable unless frequently agitated. Do not store in drums. Ground all metal containers during storage and handling. Store away from excessive heat (e.g. steampipes, radiators), from sources of ignition and from reactive materials. Store in a dry area.
Keep container tightly closed when not in use.

Handling Procedures

Do not handle material near food, feed or drinking water. This material is a severe irritant. See SECTION 8, Exposure Controls/Personal Protection, prior to handling. Ground all containers when transferring material. Use non-sparking tools and grounding cables when transferring. Wash after handling and shower at end of work period.

Other

CONTAINERS HAZARDOUS WHEN EMPTY. Since emptied containers retain product residue (vapors and/or liquid) follow all MSDS and label warnings even after container is emptied. Residual vapors in empty containers may explode on ignition. DO NOT cut, drill, grind or weld on or near container. Improper disposal or re-use of this container may be dangerous and illegal. Refer to applicable local, state and federal regulations. Dispose empty container in a sanitary landfill or by incineration as allowed by state and local authorities. Avoid inhalation of smoke if incinerated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limit Information

No		CAS REG NO	WEIGHT (%)
1	*Xylene*	*1330-20-7*	*83.000*
2	*Ethylbenzene*	*100-41-4*	*17.000*

Comp.		ROHM AND HAAS		OSHA		ACGIH	
No.	Units	TWA	STEL	TWA	STEL	TWA	STEL
1	ppm	50 Skin	75 Skin	100	150	100	150
2	ppm	50	75	100	125	100	125

Respiratory Protection

A respiratory protection program meeting OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

Up to 10 times the exposure limit: *Wear a MSHA/NIOSH approved (or equivalent) half-mask, air-purifying respirator.*

Up to 100 times the exposure limit: *Wear a MSHA/NIOSH approved (or equivalent) full-facepiece, air-purifying respirator,*
OR
full-facepiece, airline respirator in the demand mode.

Above 100 times the exposure limit or Unknown: *Wear a MSHA/NIOSH approved (or equivalent) self-contained breathing apparatus in the pressure demand mode,*
OR
MSHA/NIOSH approved (or equivalent) full-facepiece, airline respirator in the pressure demand mode with emergency escape provision.
Air-purifying respirators should be equipped with MSHA/NIOSH approved (or equivalent) cartridges for protection against organic vapors.

Eye Protection

Use chemical splash goggles (**ANSI Z87.1** or approved equivalent). Eye protection worn must be compatible with respiratory protection system employed.

Hand Protection

Chemical-resistant gloves should be worn whenever this material is handled.
The glove(s) listed below may provide protection against permeation. Gloves of other chemically resistant materials may not provide adequate protection:
- Nitrile
- Polyvinyl alcohol
- VITON® Synthetic Rubber (registered Trademark of E.I. du Pont Co.)

Other Protection

Use chemically resistant apron or other impervious clothing to avoid prolonged or repeated skin contact.

Engineering Controls (Ventilation)

Use explosion proof local exhaust ventilation with a minimum capture velocity of 100 ft/min. (0.5 m/sec.) at the point of vapor evolution. Refer to the current edition of ***Industrial Ventilation: A Manual of Recommended Practice*** *published by the American Conference of Governmental Industrial Hygienists for information on the design, installation, use, and maintenance of exhaust systems.*

Other Protective Equipment

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	*Clear*
Color	*Colorless*
State	*Liquid*
Odor Characteristic	*Aromatic odor*
pH	*No Data*
Viscosity	*0.62 to 0.7 CPS @ 25°C/77°F*
Specific Gravity (Water = 1)	*0.87 @ 15.6°C/60.1°F Estimate*
Vapor Density (Air = 1)	*3.6*
Vapor Pressure	*5 to 6.6 mm Hg @ 20°C/68°F Estimate*
Melting Point	*< 25°C/<77°F*
Boiling Point	*137° to 144°C/279° to 291°F*
Solubility in Water	*< 5 % @ 25°C/77°F Practically insoluble*
Percent Volatility	*100%*
Evaporation Rate (BAc = 1)	*< 1 @ 25°C/77°F*

See Section 5, Fire Fighting Measures

10. STABILITY AND REACTIVITY

Instability

This material is considered stable. However, avoid contact with ignition sources (e.g. sparks, open flame, heated surfaces).

Hazardous Decomposition Products

There are no known hazardous decomposition products for this material.

Hazardous Polymerization

Product will not undergo polymerization.

Incompatibility

Avoid contact with strong oxidizing agents.

11. TOXICOLOGICAL INFORMATION

Acute Data

Oral LD50 - rat: 4300 mg/kg
Dermal LD50 - rabbit: 14100 mg/kg
Inhalation LC50 - rat: 6700 ppm for 4 hr
Skin Irritation - rabbit: slight to moderate.
Eye Irritation - rabbit: moderate to severe.
Inhalation TCLo - human: 200 ppm

12. ECOLOGICAL INFORMATION

No Applicable Data

13. DISPOSAL CONSIDERATIONS

Procedure

Incinerate liquid and contaminated solids in accordance with local, state, and federal regulations. (See 40 CFR 268)
The above recommendation covers disposal of material as supplied.

14. TRANSPORT INFORMATION

US DOT Hazard Class	*Call Corporate Logistics if description needed for shipping.*

15. REGULATORY INFORMATION

Workplace Classification

This product is considered hazardous under the OSHA Hazard Communication Standard (29CFR 1910.1200).

This product is a 'controlled product' under the Canadian Workplace Hazardous Materials Information System (WHMIS).

SARA TITLE 3: Section 311/312 Categorizations (40CFR 370)

This product is a hazardous chemical under 29CFR 1910.1200, and is categorized as an immediate and delayed health, and flammability physical hazard.

SARA TITLE 3: Section 313 Information (40CFR 372)

This product contains a chemical which is listed in Section 313 at or above ***de minimis*** *concentrations. The following listed chemicals are present: (Quantity present is found elsewhere on this MSDS.)*
- Xylene (mixed isomers) (1330-20-7)
- Ethylbenzene (100-41-4)

CERCLA Information (40CFR 302.4)

This material is regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) Title III Section 304. This material is or contains chemical(s) listed in 40 CFR Table 302.4 or nondesignated RCRA ICR substance(s). (Nondesignated ICR substances apply to materials that will not be reused.) The Reportable Quantity(s) (RQ) are listed below. Releases in excess of its reportable quantity must be reported to the National Response Center (1-800-424-8802) and to the appropriate state and local emergency response organizations.
Xylene (1330-20-7) 100lbs.
Ethylbenzene (100-41-4) 1000lbs.

Waste Classification

When a decision is made to discard this material as supplied, it is classified as a RCRA hazardous waste. hazardous waste number: U239 (40 CFR 261).

United States

All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

16. OTHER INFORMATION

Rohm and Haas Hazard Rating		Scale
Toxicity	3	4=EXTREME
Fire	3	3=HIGH
Reactivity	0	2=MODERATE
Special	-	1=SLIGHT
		0=INSIGNIFICANT

Ratings are based on Rohm and Haas guidelines, and are intended for internal use.

Supplier Information

Ashland Chemical Co.
Division of Ashland Oil, Inc.
P.O. Box 2219
Columbus, Ohio 43216
Emergency Telephone: (606) 324-1133

Unocal Chemicals Division, Petrochemicals Group
Union Oil Company of California
1345 N. Meacham
Schaumburg, Illinois 60196
Telephone: (215) 753-1903

Exxon Chemical Americas
P.O. Box 3272
Houston, TX 77001
Emergency Telephone: (713) 870-6000

BP Chemicals America Inc.

200 Public Square
Cleveland, Ohio 44114-2375
Telephone: (800) 321-8642 (Outside Ohio)

91.00970912

ABBREVIATIONS:
ACGIH = American Conference of Governmental Industrial Hygienists OSHA = Occupational Safety and Health Administration TLV = Threshold Limit Value PEL = Permissible Exposure Limit TWA = Time Weighted Average STEL = Short-Term Exposure Limit BAc = Butyl acetate *Italics* denote a revision from previous MSDS in this area.

MATERIAL SAFETY DATA SHEET
Rohm and Haas Company

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

2,2'-Dichloroethyl ether

Product Code : 80014
Key : 907872-1

MSDS Date : 04/07/93

COMPANY IDENTIFICATION

ROHM AND HAAS COMPANY
100 INDEPENDENCE MALL WEST
PHILADELPHIA, PA 19106-2399

EMERGENCY TELEPHONE NUMBERS

HEALTH EMERGENCY : 215-592-3000
SPILL EMERGENCY : 215-592-3000
CHEMTREC : 800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS.

No		CAS REG NO	WEIGHT (%)
1	2,2'-Dichloroethyl ether	111-44-4	99+%

See Section 8, Exposure Controls / Personal Protection

3. HAZARDS IDENTIFICATION

Primary Routes of Exposure

Inhalation
Skin Contact
Eye Contact
Dermal Absorption
Ingestion

Inhalation

Inhalation of vapor or mist is possibly fatal.
Inhalation of vapor or mist can cause the following:
- irritation of nose, throat, and lungs - coughing - breathing difficulty - shortness of breath - headache - nausea - vomiting - possible death

Eye Contact

Direct contact with material can cause the following:
- tearing - temporary corneal injury - corneal burns

Skin Contact

This material can be fatal if absorbed through the skin.
Material can cause the following:
- slight skin irritation - dermatitis

Ingestion

Material can be fatal if swallowed,
Material can cause the following:

- gastrointestinal irritation - coughing - wheezing - headache - nausea - vomiting - death

4. FIRST AID MEASURES

Inhalation

Move subject to fresh air. If exposed to toxic fumes, move subject to fresh air. Give artificial respiration if breathing has stopped. Get prompt medical attention.

Eye Contact

IMMEDIATELY flush eyes with a large amount of water for at least 15 minutes. Get prompt medical attention.

Skin Contact

IMMEDIATELY get under a safety shower. Remove contaminated clothing. Wash skin thoroughly with soap and water. Get prompt medical attention. Wash contaminated clothing thoroughly before reuse. Do not take clothing home to be laundered. Discard contaminated shoes, belts and other articles made of leather.

Ingestion

Induce vomiting by giving 2 glasses of water to drink and touching back of subject's throat with finger. IMMEDIATELY see a physician. Never give anything by mouth to an unconscious person.

Note to Physician

No specific antidote, treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point	63°C/145°F Pensky Martens Closed Cup
Auto-ignition Temperature	369°C/696°F
Lower Explosive Limit	No Data
Upper Explosive Limit	No Data

Unusual Hazards

Material is NOT soluble in water. Vapors are heavier than air.
Combustion generates toxic fumes of the following:
- hydrogen chloride

Extinguishing Agents

Use the following extinguishing media when fighting fires involving this material:
- carbon dioxide - dry chemical - foam - water spray

Personal Protective Equipment

Wear self-contained breathing apparatus (pressure-demand MSHA/NIOSH approved or equivalent) and full protective gear.

Special Procedures

Move containers promptly out of fire zone. If removal is impossible, cool containers with water spray. Liquid is not water soluble. Blanket material with water, foam or inert gas that has been gently applied (floated) over the surface. DO NOT use a solid stream of water. A solid stream of water can spread fire. Remain upwind. Avoid breathing noxious fumes from fire-exposed material.

6. ACCIDENTAL RELEASE MEASURES

Personal Protection

Wear a MSHA/NIOSH approved (or equivalent) full-facepiece air-purifying respirator. Equip with organic vapor cartridges and dust and mist filters. Wear compatible, chemically resistant gloves. Wear protective clothing including splash proof goggles and rubber overshoes.
Protective clothing made of the following material should be worn to avoid skin contact:
- TEFLON-coated NOMEX
Remove all contaminated clothing promptly. Wash all exposed skin areas with soap and water immediately after exposure. Thoroughly launder clothing before reuse. Do not take clothing home to be laundered.

Procedures

Evacuate the spill area immediately. Contain spills immediately with inert materials (e.g. sand, earth). Eliminate all ignition sources. If material is spilled in a confined area ventilate the area well. Avoid all contact. Transfer liquids and solid diking material to separate suitable containers for recovery or disposal.
WARNING: KEEP SPILLS AND CLEANING RUNOFFS OUT OF MUNICIPAL SEWERS AND OPEN BODIES OF WATER.

7. HANDLING AND STORAGE

Storage Conditions

Avoid temperature extremes during storage; ambient temperature preferred.
Do not store this material near food, feed or drinking water. Store in a well ventilated area.
Material can burn; limit indoor storage to approved areas equipped with automatic sprinklers. Store away from excessive heat (e.g. steampipes, radiators), from sources of ignition and from reactive materials. Material may form peroxides upon long-term storage. Store in a dry area. Keep container tightly closed when not in use.

Handling Procedures

This material is a lachrymator (causes eyes to tear). See Section 8, EXPOSURE CONTROLS/PERSONAL PROTECTION prior to handling.
Do not handle material near food, feed or drinking water. Slight positive pressure may develop upon long-term storage in air-tight containers. Carefully relieve any pressure build-up when opening container. Wash after handling and shower at end of work period.

Other

CONTAINERS HAZARDOUS WHEN EMPTY. Since emptied containers retain product residue (vapors and/or liquid) follow all MSDS and label warnings even after container is emptied. Dispose empty container in a sanitary landfill or by incineration as allowed by state and local authorities. Avoid inhalation of smoke if incinerated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limit Information

No		CAS REG NO	WEIGHT (%)
1	2,2'-Dichloroethyl ether	111-44-4	99+%

Comp.		ROHM AND HAAS		OSHA		ACGIH	
No.	Units	TWA	STEL	TWA	STEL	TWA	STEL
1	ppm	0.5 Skin	1.5 Skin	5 Skin	10 Skin	5 Skin	10

Respiratory Protection

A respiratory protection program meeting OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use. None required if airborne concentrations are maintained below the TWA/TLV's listed in Section 8, EXPOSURE CONTROLS/PERSONAL PROTECTION.

Up to 10 times the TWA/TLV: Wear a MSHA/NIOSH approved (or equivalent) full-facepiece, air-purifying respirator.

Up to 100 times the TWA/TLV or Unknown: Wear a MSHA/NIOSH approved (or equivalent) self-contained breathing apparatus in the positive pressure mode,
OR,
MSHA/NIOSH approved (or equivalent) full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

Air-purifying respirators should be equipped with organic vapor cartridges and dust and mist filters.

Eye Protection

Use chemical splash goggles (ANSI Z87.1 or approved equivalent). Eye protection worn must be compatible with respiratory protection system employed.

Hand Protection

NOTE: Material may be absorbed through the skin in lethal amounts.
Chemically resistant gloves should be worn whenever this material is handled.
Glove permeation data does not exist for this material. The following glove(s) should be used for splash protection only:
- Neoprene
Gloves should be removed and replaced immediately if there is any indication of degradation or chemical breakthrough.
Rinse and remove gloves immediately after use. Wash hands with soap and water. Gloves should be decontaminated before discarding.

Other Protection

Where splashing is possible, full chemically resistant protective clothing (e.g. acid suit) and boots are required.

Engineering Controls (Ventilation)

Use local exhaust ventilation with a minimum capture velocity of 100 ft/min. (0.5 m/sec.) at the point of vapor evolution. Refer to the current edition of Industrial Ventilation: A Manual of Recommended Practice published by the American Conference of Governmental Industrial Hygienists for information on the design, installation, use, and maintenance of exhaust systems.

Other Protective Equipment

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear
Color	Colorless
State	Liquid
Odor Characteristic	Solvent odor
Odor Threshold	< 35 ppm
Viscosity	Like water
Specific Gravity (Water = 1)	1.22 @ 25°C/77°F
Vapor Density (Air = 1)	4.94
Vapor Pressure	0.7 mm Hg @ 20°C/68°F
Melting Point	-46.7°C/-52.1°F
Boiling Point	176.6°C/349.9°F
Solubility in Water	Practically insoluble
Solubility in Organic So	Highly soluble
Percent Volatility	Negligible
Evaporation Rate (BAc = 1)	< 1

See Section 5, Fire Fighting Measures

10. STABILITY AND REACTIVITY

Instability

This material is considered stable. However, keep away from moisture, heat or flame.

Hazardous Decomposition Products

Thermal decomposition may yield the following:
- hydrogen chloride

Hazardous Polymerization

Product will not undergo hazardous polymerization.

Incompatibility

Avoid contact with the following:
- oxidizing agents

11. TOXICOLOGICAL INFORMATION

Acute Data

Oral LD50 - rat: 75 mg/kg
Dermal LD50 - rabbit: 90 mg/kg
Skin Irritation - rabbit: 500 mg open slight irritation.
Eye Irritation - rabbit: 100 mg severe irritation.

12. ECOLOGICAL INFORMATION

No Applicable Data

13. DISPOSAL CONSIDERATIONS

Procedure

Incinerate liquid and contaminated solids in accordance with local, state, and federal regulations.

14. TRANSPORT INFORMATION

Proper Shipping Name	COMBUSTIBLE LIQUID, N.O.S. (DICHLOROETHYL ETHER)
US DOT Hazard Class	COMBUSTIBLE LIQUID
Identification Number	NA1993
DOT Shipping Label	None

The above information applies to the U.S. DOT classification of this material (49 CFR 172.101). Various exemptions and/or restrictions may apply.

15. REGULATORY INFORMATION

Workplace Classification

This product is considered hazardous under the OSHA Hazard Communication Standard (29CFR 1910.1200).

This product is a 'controlled product' under the Canadian Workplace Hazardous Materials Information System (WHMIS).

SARA TITLE 3: Section 311/312 Categorizations (40CFR 370)

This product is a hazardous chemical under 29CFR 1910.1200, and is categorized as an immediate health and flammability physical hazard.

SARA TITLE 3: Section 313 Information (40CFR 372)

This product contains a chemical which is listed in Section 313 at or above de minimis concentrations. The following listed chemicals are present: (Quantity present is found elsewhere on this MSDS.)
- Bis(2-chloroethyl)ether (111-44-4)

CERCLA Information (40CFR 302.4)

This material has a component or components with a reportable quantity under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) Title III Section 304. The components, CAS numbers, and reportable quantities

are listed below. Spills of a component in excess of its reportable quantity must be reported to the National Response Center (1-800-424-8802) and to the appropriate state and local emergency response organizations. 2,2'-Dichloroethyl ether (111-44-4) 10lbs.

Waste Classification

When a decision is made to discard this material as supplied, it is classified as a RCRA hazardous waste, hazardous waste number: U025 (40 CFR 261).

United States

All components of this product are listed or are excluded from listing on the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

16. OTHER INFORMATION

Rohm and Haas Hazard Rating		Scale
Toxicity	3	4=EXTREME
Fire	2	3=HIGH
Reactivity	0	2=MODERATE
Special	-	1=SLIGHT
		0=INSIGNIFICANT

Ratings are based on Rohm and Haas guidelines, and are intended for internal use.

ABBREVIATIONS:

ACGIH = American Conference of Governmental Industrial Hygienists
OSHA = Occupational Safety and Health Administration
TLV = Threshold Limit Value
PEL = Permissible Exposure Limit
TWA = Time Weighted Average
STEL = Short-Term Exposure Limit
BAc = Butyl acetate
| Bar denotes a revision from previous MSDS in this area.

93.00930407

M2A - 951229093627 C

MATERIAL SAFETY DATA SHEET
Rohm and Haas Company

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Technical DDT

Product Code : 81004
Key : 908454-5

MSDS Date : 10/15/94

COMPANY IDENTIFICATION

ROHM AND HAAS COMPANY
100 INDEPENDENCE MALL WEST
PHILADELPHIA, PA 19106-2399

EMERGENCY TELEPHONE NUMBERS

HEALTH EMERGENCY : 215-592-3000
SPILL EMERGENCY : 215-592-3000
CHEMTREC : 800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

No		CAS REG NO	WEIGHT (%)
1	1,1,1-Trichloro-2,2-bis(chlorophenyl)ethane ...	50-29-3	>97.0%

See Section 8, Exposure Controls / Personal Protection

3. HAZARDS IDENTIFICATION

Primary Routes of Exposure

Inhalation
Ingestion
Dermal Absorption
Skin Contact
Eye Contact

Inhalation

Inhalation of dust can cause the following:
- irritation of nose, throat, and lungs

Eye Contact

Material can cause the following:
- irritation

Skin Contact

Prolonged or repeated skin contact can cause the following:
- slight skin irritation
This material can be absorbed through intact skin in harmful amounts.

Ingestion

Material is harmful if swallowed.
Material can be fatal in large amounts.
Material can cause the following:
- central nervous system depression

Delayed Effects

DDT is listed by the National Toxicology Program (NTP) and the International Agency for Research on Cancer (IARC) as a possible cancer causing agent.

4. FIRST AID MEASURES

Inhalation

Move subject to fresh air. If breathing is difficult, give oxygen. Give artificial respiration if breathing has stopped. Call a physician.

Eye Contact

Flush eyes with a large amount of water for at least 15 minutes. Get prompt medical attention.

Skin Contact

Remove contaminated clothing. Wash skin thoroughly with soap and water. See a physician. Wash contaminated clothing thoroughly before reuse. Do not take clothing home to be laundered.

Ingestion

Induce vomiting by giving 2 glasses of water to drink and touching back of subject's throat with finger. Never give anything by mouth to an unconscious person.

Note to Physician

Evacuation of the stomach is advisable due to the presence of a moderately toxic chlorinated hydrocarbon. Because of the sensitizing effects of the hydrocarbon compounds on the myocardium, sympathomimetic amines, like epinephrine, should be avoided.

5. FIRE FIGHTING MEASURES

Flash Point	Nonflammable
Auto-ignition Temperature	Not Applicable
Lower Explosive Limit	Not Applicable
Upper Explosive Limit	Not Applicable

Unusual Hazards

Pesticide particulates can become airborne.
Combustion generates toxic fumes of the following:
- hydrogen chloride - phosgene gas - carbon oxides
Material is NOT soluble in water.

Extinguishing Agents

Use the following extinguishing media when fighting fires involving this material:
- carbon dioxide - dry chemical - water spray

Personal Protective Equipment

Wear self-contained breathing apparatus (pressure-demand MSHA/NIOSH approved or equivalent) and full protective gear.

Special Procedures

Minimize exposure. Remain upwind. Avoid breathing smoke. Use water spray to cool containers exposed to fire. Contain run-off.

6. ACCIDENTAL RELEASE MEASURES

Personal Protection

Wear a MSHA/NIOSH approved (or equivalent) half-mask air-purifying respirator. Equip with dust and mist filters. Wear compatible, chemically resistant gloves.
Wear protective clothing including splash proof goggles and rubber overshoes.
Remove all contaminated clothing promptly. Wash all exposed skin areas with soap and water immediately after exposure.
For further information see SECTION 8, Exposure Controls/Personal Protection.

Procedures

Evacuate the spill area. Keep dust to a minimum. Ventilate the spill area. Transfer spilled material to suitable containers for recovery or disposal. Avoid all contact.
WARNING: KEEP SPILLS AND CLEANING RUNOFFS OUT OF MUNICIPAL SEWERS AND OPEN BODIES OF WATER.

7. HANDLING AND STORAGE

Storage Conditions

The maximum recommended storage temperature for this material is 66°C/150°F. Store in an area isolated from other materials to prevent contamination.
Do not store this material near food, feed or drinking water. Store in a well ventilated area. Store away from excessive heat (e.g. steampipes, radiators), from sources of ignition and from reactive materials. Store in a dry area. Keep container tightly closed when not in use.

Handling Procedures

Do not handle material near food, feed or drinking water. Avoid excessive dusting. Wash after handling and shower at end of work period.

Other

Improper disposal or re-use of this container may be dangerous and illegal. Refer to applicable local, state and federal regulations. Dispose empty container in a sanitary landfill or by incineration as allowed by state and local authorities. Avoid inhalation of smoke if incinerated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limit Information

No		CAS REG NO	WEIGHT (%)
1	1,1,1-Trichloro-2,2-bis(chlorophenyl)ethane ...	50-29-3	>97.0%

Comp.		ROHM AND HAAS		OSHA		ACGIH	
No.	Units	TWA	STEL	TWA	STEL	TWA	STEL
1	mg/m³	1	None	1 Skin	None	1	None

Respiratory Protection

A respiratory protection program meeting OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use. For airborne concentrations up to 10 times the TWA/TLV's listed in "Exposure Limit Information", wear a MSHA/NIOSH approved (or equivalent) half-mask, air-purifying respirator. Air-purifying respirators should be equipped with MSHA/NIOSH approved (or equivalent) filters for protection against dusts and mists.

Eye Protection

Use safety glasses (ANSI Z87.1 or approved equivalent). Eye protection worn must be compatible with respiratory protection system employed.

Hand Protection

The glove(s) listed below provide protection against permeation: - Cotton or canvas
Gloves should be removed and replaced immediately if there is any indication of degradation or chemical breakthrough.

Other Protection

Use chemically resistant apron or other impervious clothing to avoid prolonged or repeated skin contact. Where splashing is possible, full chemically resistant protective clothing (e.g. acid suit) and boots are required. Work clothing should be removed at the end of the shift and laundered by the employer.

Engineering Controls (Ventilation)

Use local exhaust ventilation with a minimum capture velocity of 150 ft/min. (0.75 m/sec.) at the point of dust or mist evolution. Refer to the current edition of Industrial Ventilation: A Manual of Recommended Practice published by the American Conference of Governmental Industrial Hygienists for information on the design, installation, use, and maintenance of exhaust systems.

Other Protective Equipment

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear to opaque
Color	Colorless to white
State	Crystalline solid
Odor Characteristic	Aromatic odor

pH	5.0 to 8.0
Viscosity	Not Applicable
Specific Gravity (Water = 1)	1.38 @ 100°C/212°F
Vapor Density (Air = 1)	Not Applicable
Vapor Pressure	Negligible
Melting Point	89°C/192°F Minimum
Boiling Point	Not Applicable--Decomposes
Solubility in Water	Insoluble
Solubility in Organic So	Highly soluble
Percent Volatility	Not Applicable
Evaporation Rate (BAc = 1)	Not Applicable

See Section 5, Fire Fighting Measures

10. STABILITY AND REACTIVITY

Instability

This material is considered stable. However, avoid temperatures above 100°C/212°F.

Hazardous Decomposition Products

Thermal decomposition may yield the following:
- hydrogen chloride - phosgene

Hazardous Polymerization

Product will not undergo polymerization.

Incompatibility

Avoid contact with the following:
- oxidizing agents - bases - aluminum - iron

11. TOXICOLOGICAL INFORMATION

Acute Data

Oral LDLo - human: 6 mg/kg
Oral LD50 - rat: 113 mg/kg
Dermal LD50 - rabbit: 300 mg/kg

Epidemiology Data

In a case control epidemiology study of pancreas cancer among workers at one plant between 1948 and 1988, an association was shown between pancreas cancer and previous exposure to a group of chemicals, one of which was DDT. This study was designed to identify exposure that may be associated with a disease but does not enable the identification of a cause and effect relationship. There is no published information indicating that DDT itself is a risk factor for human pancreas cancer. Two cohort epidemiologic studies of men involved in the manufacture of DDT have not shown elevated risk of pancreas cancer. Also, a prospective study of the general population who had exposure to DDT did not report elevation in the risk of pancreas cancer.

12. ECOLOGICAL INFORMATION

Environmental Toxicity

Aquatic toxicity rating, 96 Hour TLM: < 1 ppm

This product is toxic to fish, birds, and other wildlife.

13. DISPOSAL CONSIDERATIONS

Procedure

For disposal, incinerate this material at a facility that complies with local, state, and federal regulations. The above recommendation covers disposal of material as supplied.

14. TRANSPORT INFORMATION

US DOT Hazard Class ..... Call Distribution Safety if description needed for shipping.

15. REGULATORY INFORMATION

Workplace Classification

This product is considered hazardous under the OSHA Hazard Communication Standard (29CFR 1910.1200).

This product is a 'controlled product' under the Canadian Workplace Hazardous Materials Information System (WHMIS).

SARA TITLE 3: Section 311/312 Categorizations (40CFR 370)

This product is a hazardous chemical under 29CFR 1910.1200, and is categorized as an immediate and delayed health hazard.

SARA TITLE 3: Section 313 Information (40CFR 372)

This product does not contain a chemical which is listed in Section 313 at or above de minimis concentrations.

CERCLA Information (40CFR 302.4)

This material is regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) Title III Section 304. This material is or contains chemical(s) listed in 40 CFR Table 302.4 or nondesignated RCRA ICR substance(s). (Nondesignated ICR substances apply to materials that will not be reused.) The Reportable Quantity(s) (RQ) are listed below. Releases in excess of its reportable quantity must be reported to the National Response Center (1-800-424-8802) and to the appropriate state and local emergency response organizations.
p,p'-DDT (50-29-3) 1lb.

Waste Classification

When a decision is made to discard this material as supplied, it is classified as a RCRA hazardous waste, hazardous waste number: U061 (40 CFR 261).

United States

All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

California (Proposition 65)

This product contains a component or components known to the state of California to cause cancer:
- DDT (Dichlorodiphenyltrichloroethane) (50-29-3)

16. OTHER INFORMATION

Rohm and Haas Hazard Rating		Scale
Toxicity	2	4=EXTREME
Fire	1	3=HIGH
Reactivity	0	2=MODERATE
Special	-	1=SLIGHT
		0=INSIGNIFICANT

Ratings are based on Rohm and Haas guidelines, and are intended for internal use.

ABBREVIATIONS:

ACGIH = American Conference of Governmental Industrial Hygienists
OSHA = Occupational Safety and Health Administration
TLV = Threshold Limit Value
PEL = Permissible Exposure Limit
TWA = Time Weighted Average
STEL = Short-Term Exposure Limit
BAc = Butyl acetate
| Bar denotes a revision from previous MSDS in this area.

SECTION 1. - - - - - - - - - - CHEMICAL IDENTIFICATION- - - - - - - - - -

CATALOG #: 147141

NAME: **NAPHTHALENE, 99%**

SECTION 2. - - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - - -

CAS #: 91-20-3

MF: C10H8

EC NO: 202-049-5

SYNONYMS

ALBOCARBON * CAMPHOR TAR * MIGHTY 150 * MIGHTY RD1 * MOTH BALLS * MOTH FLAKES * NAFTALEN (POLISH) * NAPHTHALENE (ACGIH:OSHA) * NAPHTHALIN * NAPHTHALINE * NAPHTHENE * NCI-C52904 * RCRA WASTE NUMBER U165 * TAR CAMPHOR * WHITE TAR *

SECTION 3. - - - - - - - - - - HAZARDS IDENTIFICATION - - - - - - - - - -

LABEL PRECAUTIONARY STATEMENTS

FLAMMABLE (USA)

HIGHLY FLAMMABLE (EU)

TOXIC

MAY CAUSE CANCER.

HARMFUL BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.

IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN.

MAY CAUSE SENSITIZATION BY SKIN CONTACT.

TARGET ORGAN(S):

BLOOD

EYES

KIDNEYS

LUNGS

KEEP AWAY FROM SOURCES OF IGNITION - NO SMOKING.

IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).

IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.

WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE PROTECTION.

HYGROSCOPIC

SECTION 4. - - - - - - - - - - FIRST-AID MEASURES- - - - - - - - - - -

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.

ASSURE ADEQUATE FLUSHING OF THE EYES BY SEPARATING THE EYELIDS WITH FINGERS.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.

CALL A PHYSICIAN.

DISCARD CONTAMINATED CLOTHING AND SHOES.

SECTION 5. - - - - - - - - - - FIRE FIGHTING MEASURES - - - - - - - - - -

EXTINGUISHING MEDIA

CARBON DIOXIDE.

DRY CHEMICAL POWDER.

FOAM AND WATER SPRAY ARE EFFECTIVE BUT MAY CAUSE FROTHING.

SPECIAL FIREFIGHTING PROCEDURES

WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.

FLAMMABLE SOLID.

UNUSUAL FIRE AND EXPLOSIONS HAZARDS

THIS MATERIAL, LIKE MOST MATERIALS IN POWDER FORM, IS CAPABLE OF CREATING A DUST EXPLOSION.

SECTION 6. - - - - - - - - - ACCIDENTAL RELEASE MEASURES- - - - - - - - - -

EVACUATE AREA.

WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.

SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL.

AVOID RAISING DUST.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

SECTION 7. - - - - - - - - - - HANDLING AND STORAGE- - - - - - - - - - -

REFER TO SECTION 8.

SECTION 8. - - - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION- - - - - -

WEAR APPROPRIATE NIOSH/MSHA-APPROVED RESPIRATOR, CHEMICAL-RESISTANT GLOVES, SAFETY GOGGLES, OTHER PROTECTIVE CLOTHING.
USE ONLY IN A CHEMICAL FUME HOOD.
SAFETY SHOWER AND EYE BATH.
DO NOT BREATHE DUST.
AVOID CONTACT WITH FUMES.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
AVOID PROLONGED OR REPEATED EXPOSURE.
WASH THOROUGHLY AFTER HANDLING.
CARCINOGEN.
TOXIC.
IRRITANT.
SENSITIZER.
KEEP TIGHTLY CLOSED.
KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME.
HYGROSCOPIC
STORE IN A COOL DRY PLACE.

SECTION 9. - - - - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - - - - -

APPEARANCE AND ODOR
WHITE CRYSTALLINE FLAKES

PHYSICAL PROPERTIES

BOILING POINT: 218 C
MELTING POINT: 80 C TO 82 C
FLASHPOINT 174 F
78C

EXPLOSION LIMITS IN AIR:
UPPER 5.9%
LOWER 0.9%

AUTOIGNITION TEMPERATURE: 978 F 525C
VAPOR PRESSURE: 0.03MM 25 C 1MM 53 C
VAPOR DENSITY: 4.4

SECTION 10. - - - - - - - - -STABILITY AND REACTIVITY - - - - - - - - - -

INCOMPATIBILITIES
OXIDIZING AGENTS

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
TOXIC FUMES OF:
CARBON MONOXIDE, CARBON DIOXIDE

SECTION 11. - - - - - - - - - TOXICOLOGICAL INFORMATION - - - - - - - - -

ACUTE EFFECTS
HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN.
CAUSES EYE AND SKIN IRRITATION.
MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT.
SYMPTOMS OF EXPOSURE MAY INCLUDE BURNING SENSATION, COUGHING, WHEEZING, LARYNGITIS, SHORTNESS OF BREATH, HEADACHE, NAUSEA AND VOMITING.
ABSORPTION INTO THE BODY LEADS TO THE FORMATION OF METHEMOGLOBIN WHICH IN SUFFICIENT CONCENTRATION CAUSES CYANOSIS. ONSET MAY BE DELAYED 2 TO 4 HOURS OR LONGER.
MAY CAUSE ALLERGIC SKIN REACTION.
NAPHTHALENE IS RETINOTOXIC AND SYSTEMIC ABSORPTION OF ITS VAPORS ABOVE 15PPM, MAY RESULT IN CATARACTS, OPTICAL NEURITIS, INJURIES TO THE CORNEA AND MARKED EYE IRRITATION. INGESTION OF LARGE QUANTITIES HAVE BEEN REPORTED TO CAUSE SEVERE HEMOLYTIC ANEMIA AND HEMOGLOBINURIA.

CHRONIC EFFECTS
CARCINOGEN.
TARGET ORGAN(S):
EYES

BLOOD
KIDNEYS
LUNGS
RTECS #: QJ0525000
NAPHTHALENE
IRRITATION DATA

SKN-RBT 495 MG OPEN MLD	UCDS** 1/11/1968
EYE-RBT 100 MG MLD	BIOFX* 16-4/1970

TOXICITY DATA

ORL-CHD LDLO:100 MG/KG	28ZRAQ -,228,1960
UNR-HMN LDLO:29 MG/KG	YKYUA6 31,1499,1980
UNR-MAN LDLO:74 MG/KG	85DCAI 2,73,1970
ORL-RAT LD50:490 MG/KG	85GMAT -,89,1982
IHL-RAT LC50:>340 MG/M3/1H	BIOFX* 16-4/1970
SKN-RAT LD50:>2500 MG/KG	TXAPA9 14,515,1969
ORL-MUS LD50:533 MG/KG	FAATDF 4,406,1984
IPR-MUS LD50:150 MG/KG	NTIS** AD691-490
SCU-MUS LD50:969 MG/KG	TOIZAG 20,772,1973
IVN-MUS LD50:100 MG/KG	CSLNX* NX#00203
SKN-RBT LD50:>20 GM/KG	NTIS** AD-A062-138
ORL-GPG LD50:1200 MG/KG	GISAAA 47(11),78,1982

TARGET ORGAN DATA
SENSE ORGANS AND SPECIAL SENSES (PTOSIS)
BEHAVIORAL (SOMNOLENCE)
BEHAVIORAL (TREMOR)
BEHAVIORAL (CHANGE IN MOTOR ACTIVITY)
BEHAVIORAL (ATAXIA)
LUNGS, THORAX OR RESPIRATION (RESPIRATORY DEPRESSION)
LUNGS, THORAX OR RESPIRATION (TUMORS)
TUMORIGENIC (NEOPLASTIC BY RTECS CRITERIA)
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

SECTION 12. - - - - - - - - - - ECOLOGICAL INFORMATION - - - - - - - - - -

DATA NOT YET AVAILABLE.

SECTION 13. - - - - - - - - - - DISPOSAL CONSIDERATIONS - - - - - - - - -

DISSOLVE OR MIX THE MATERIAL WITH A COMBUSTIBLE SOLVENT AND BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - - - - - - TRANSPORT INFORMATION - - - - - - - - - -

CONTACT ALDRICH CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - - - - - - REGULATORY INFORMATION - - - - - - - - - -

EUROPEAN INFORMATION
HIGHLY FLAMMABLE
TOXIC
R 45
MAY CAUSE CANCER.
R 20/21/22
HARMFUL BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.
R 36/37/38
IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN.
R 43
MAY CAUSE SENSITIZATION BY SKIN CONTACT.
HIGHLY FLAMMABLE
S 16
KEEP AWAY FROM SOURCES OF IGNITION - NO SMOKING.
S 45
IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).
S 26
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.
S 36/37/39

WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE PROTECTION.

REVIEWS, STANDARDS, AND REGULATIONS

OEL=MAK

ACGIH TLV-NOT CLASSIFIABLE AS A HUMAN CARCINOGEN DTLVS* TLV/BEI,1997

ACGIH TLV-STEL 79 MG/M3 (15 PPM) DTLVS* TLV/BEI,1997

ACGIH TLV-TWA 52 MG/M3 (10 PPM) DTLVS* TLV/BEI,1997

EPA FIFRA 1988 PESTICIDE SUBJECT TO REGISTRATION OR RE-REGISTRATION FEREAC 54,7740,1989

MSHA STANDARD-AIR:TWA 10 PPM (50 MG/M3) DTLVS* 3,177,1971

OSHA PEL (GEN INDU):8H TWA 10 PPM (50 MG/M3) CFRGBR 29,1910.1000,1994

OSHA PEL (CONSTRUC):8H TWA 10 PPM (50 MG/M3) CFRGBR 29,1926.55,1994

OSHA PEL (SHIPYARD):8H TWA 10 PPM (50 MG/M3) CFRGBR 29,1915.1000,1993

OSHA PEL (FED CONT):8H TWA 10 PPM (50 MG/M3) CFRGBR 41,50-204.50,1994

OEL-ARAB REPUBLIC OF EGYPT:TWA 10 PPM (50 MG/M3) JAN 1993

OEL-AUSTRALIA:TWA 10 PPM (50 MG/M3);STEL 15 PPM (75 MG/M3) JAN 1993

OEL-BELGIUM:TWA 10 PPM (52 MG/M3);STEL 15 PPM (79 MG/M3) JAN 1993

OEL-DENMARK:TWA 10 PPM (50 MG/M3) JAN 1993

OEL-FINLAND:TWA 10 PPM (50 MG/M3);STEL 20 PPM (100 MG/M3) JAN 1993

OEL-FRANCE:TWA 10 PPM (50 MG/M3) JAN 1993

OEL-GERMANY:TWA 10 PPM (50 MG/M3) JAN 1993

OEL-HUNGARY:TWA 40 MG/M3;STEL 80 MG/M3;SKIN JAN 1993

OEL-THE NETHERLANDS:TWA 10 PPM (50 MG/M3) JAN 1993

OEL-THE PHILIPPINES:TWA 10 PPM (50 MG/M3) JAN 1993

OEL-POLAND:TWA 20 MG/M3 JAN 1993

OEL-RUSSIA:STEL 20 MG/M3 JAN 1993

OEL-SWITZERLAND:TWA 10 PPM (50 MG/M3) JAN 1993

OEL-UNITED KINGDOM:TWA 10 PPM (50 MG/M3);STEL 15 PPM (75 MG/M3) JAN 1993

OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA CHECK ACGIH TLV

OEL IN NEW ZEALAND, SINGAPORE, VIETNAM CHECK ACGIH TLV

NIOSH REL TO NAPHTHALENE-AIR:10H TWA 10 PPM;STEL 15 PPM NIOSH* DHHS #92-100,1992

NOHS 1974: HZD 49600; NIS 71; TNF 4341; NOS 68; TNE 44297

NOES 1983: HZD 49600; NIS 83; TNF 7209; NOS 87; TNE 112696; TFE 5220

EPA GENETOX PROGRAM 1988, NEGATIVE: CELL TRANSFORM.-MOUSE EMBRYO

EPA GENETOX PROGRAM 1988, NEGATIVE: CELL TRANSFORM.-RLV F344 RAT EMBRYO

EPA GENETOX PROGRAM 1988, NEGATIVE: HISTIDINE REVERSION-AMES TEST

EPA TSCA SECTION 8(B) CHEMICAL INVENTORY

EPA TSCA SECTION 8(D) UNPUBLISHED HEALTH/SAFETY STUDIES

ON EPA IRIS DATABASE

EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JUNE 1998

NIOSH ANALYTICAL METHOD, 1994: HYDROCARBONS, AROMATIC, 1501

NIOSH ANALYTICAL METHOD, 1994: POLYNUCLEAR AROMATIC HYDROCARBONS BY HPLC, 5506; BY GC, 5515

NTP CARCINOGENESIS STUDIES (INHALATION);SOME EVIDENCE:MOUSE NTPTR* NTP-TR-410,92

NTP CARCINOGENESIS STUDIES; ON TEST (TWO YEAR STUDIES), OCTOBER 1997

OSHA ANALYTICAL METHOD #35

U.S. INFORMATION

THIS PRODUCT IS SUBJECT TO SARA SECTION 313 REPORTING REQUIREMENTS.

SECTION 16. - - - - - - - - - - OTHER INFORMATION- - - - - - - - - - - -

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA, ALDRICH, FLUKA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.

SECTION 1. - - - - - - - - - CHEMICAL IDENTIFICATION- - - - - - - - - -

CATALOG #: 397881

NAME: VINYL CHLORIDE, SINGLE COMPONENT STANDARD FOR EPA METHODS

SECTION 2. - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - - -

CAS #: 75-01-4

MF: C2H3CL

EC NO: 200-831-0

SYNONYMS

CHLOROETHENE * CHLOROETHYLENE * CHLORURE DE VINYLE (FRENCH) * CLORURO DI VINILE (ITALIAN) * ETHENE, CHLORO- * ETHYLENE MONOCHLORIDE * MONOCHLOROETHENE * MONOCHLOROETHYLENE * RCRA WASTE NUMBER U043 * VCM * VINILE (CLORURO DI) (ITALIAN) * VINYLCHLORID (GERMAN) * VINYL CHLORIDE (ACGIH:OSHA) * VINYL CHLORIDE MONOMER * VINYLE(CHLORURE DE) (FRENCH) * VINYL C MONOMER * WINYLU CHLOREK (POLISH) *

SECTION 3. - - - - - - - - - - HAZARDS IDENTIFICATION - - - - - - - - -

LABEL PRECAUTIONARY STATEMENTS

FLAMMABLE (USA)

HIGHLY FLAMMABLE (EU)

TOXIC

MAY CAUSE CANCER.

MAY CAUSE HERITABLE GENETIC DAMAGE.

TOXIC BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.

MAY IMPAIR FERTILITY.

CAUSES SEVERE IRRITATION.

TARGET ORGAN(S):

LIVER

BLOOD

KEEP CONTAINER TIGHTLY CLOSED.

KEEP AWAY FROM SOURCES OF IGNITION - NO SMOKING.

AVOID CONTACT WITH SKIN.

IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).

SECTION 4. - - - - - - - - - - FIRST-AID MEASURES- - - - - - - - - - -

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.

ASSURE ADEQUATE FLUSHING OF THE EYES BY SEPARATING THE EYELIDS WITH FINGERS.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

CALL A PHYSICIAN.

IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.

CALL A PHYSICIAN.

DISCARD CONTAMINATED CLOTHING AND SHOES.

SECTION 5. - - - - - - - - - FIRE FIGHTING MEASURES - - - - - - - - - -

EXTINGUISHING MEDIA

USE WATER SPRAY TO COOL FIRE-EXPOSED CONTAINERS.

SPECIAL FIREFIGHTING PROCEDURES

DO NOT EXTINGUISH BURNING GAS IF FLOW CANNOT BE SHUT OFF IMMEDIATELY.

USE WATER SPRAY OR FOG NOZZLE TO KEEP CYLINDER COOL. MOVE CYLINDER AWAY FROM FIRE IF THERE IS NO RISK.

UNUSUAL FIRE AND EXPLOSIONS HAZARDS

CONTAINER EXPLOSION MAY OCCUR UNDER FIRE CONDITIONS.

FLAMMABLE GAS.

VAPOR MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.

SECTION 6. - - - - - - - - - ACCIDENTAL RELEASE MEASURES- - - - - - - - -

EVACUATE AREA AND KEEP PERSONNEL UPWIND.

WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY
RUBBER GLOVES.
SHUT OFF LEAK IF THERE IS NO RISK.
VENTILATE THE SPILL SITE THOROUGHLY BEFORE REENTERING.

SECTION 7. - - - - - - - - - - - HANDLING AND STORAGE- - - - - - - - - - -

REFER TO SECTION 8.

SECTION 8. - - - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION- - - - - -

SELF-CONTAINED BREATHING APPARATUS.
CHEMICAL SAFETY GOGGLES.
FACESHIELD (8-INCH MINIMUM).
COMPATIBLE CHEMICAL-RESISTANT GLOVES.
IMPERVIOUS PROTECTIVE CLOTHING.
AVOID ALL CONTACT.
AVOID PROLONGED OR REPEATED EXPOSURE.
WASH THOROUGHLY AFTER HANDLING.
CARCINOGEN.
MUTAGEN.
TOXIC.
REPRODUCTIVE HAZARD.
SEVERE IRRITANT.
KEEP TIGHTLY CLOSED.
KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME.
LIGHT SENSITIVE
STORE IN A COOL DRY PLACE.

SECTION 9. - - - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - - - - -

DATA NOT AVAILABLE

SECTION 10. - - - - - - - - -STABILITY AND REACTIVITY - - - - - - - - -

STABILITY

THIS MATERIAL IS STABILIZED.

CONDITIONS TO AVOID

STORE AWAY FROM HEAT.
PROTECT FROM AIR

INCOMPATIBILITIES

MAY REACT WITH:
CHEMICALLY ACTIVE METALS
ALUMINUM
AND ITS ALLOYS.
COPPER
NITROGEN OXIDES
SENSITIVE TO LIGHT

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS

TOXIC FUMES OF:
CARBON MONOXIDE, CARBON DIOXIDE
HYDROGEN CHLORIDE GAS
PHOSGENE GAS

HAZARDOUS POLYMERIZATION

MAY UNDERGO AUTOPOLYMERIZATION.

CONDITIONS TO AVOID

MAY POLYMERIZE ON EXPOSURE TO LIGHT.
HEAT
OXIDIZING AGENTS
PEROXIDES
OXYGEN
MOISTURE

SECTION 11. - - - - - - - - - TOXICOLOGICAL INFORMATION - - - - - - - -

ACUTE EFFECTS

HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN.
CAN CAUSE SEVERE FROSTBITE.
CAUSES SEVERE IRRITATION.
HIGH CONCENTRATIONS ARE EXTREMELY DESTRUCTIVE TO TISSUES OF THE MUCOUS

MEMBRANES AND UPPER RESPIRATORY TRACT, EYES AND SKIN.
SKIN ABSORPTION MAY OCCUR.
SYMPTOMS OF EXPOSURE MAY INCLUDE BURNING SENSATION, COUGHING, WHEEZING, LARYNGITIS, SHORTNESS OF BREATH, HEADACHE, NAUSEA AND VOMITING.

CHRONIC EFFECTS
CARCINOGEN.
MAY ALTER GENETIC MATERIAL.
MAY CAUSE REPRODUCTIVE DISORDERS.
TARGET ORGAN(S):
LIVER
BLOOD
BRAIN
CENTRAL NERVOUS SYSTEM

RTECS #: KU9625000
ETHYLENE, CHLORO-

TOXICITY DATA

ORL-RAT LD50:500 MG/KG	DOWCC*
IHL-RAT LC50:18 PPH/15M	HUTODJ 1,239,1982

TARGET ORGAN DATA
SENSE ORGANS AND SPECIAL SENSES (TUMORS)
VASCULAR (TUMORS)
LUNGS, THORAX OR RESPIRATION (TUMORS)
GASTROINTESTINAL (TUMORS)
LIVER (TUMORS)
LIVER (ANGIOSARCOMA)
BLOOD (LYMPHOMA INCLUDING HODGKIN'S DISEASE)
SKIN AND APPENDAGES (TUMORS)
PATERNAL EFFECTS (TESTES, EPIDIDYMIS, SPERM DUCT)
EFFECTS ON FERTILITY (FEMALE FERTILITY INDEX)
EFFECTS ON FERTILITY (POST-IMPLANTATION MORTALITY)
EFFECTS ON FERTILITY (LITTER SIZE)
EFFECTS ON EMBRYO OR FETUS (FETOTOXICITY)
SPECIFIC DEVELOPMENTAL ABNORMALITIES (MUSCULOSKELETAL SYSTEM)
TUMORIGENIC (CARCINOGENIC BY RTECS CRITERIA)
TUMORIGENIC (EQUIVOCAL TUMORIGENIC AGENT BY RTECS CRITERIA)
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

SECTION 12. - - - - - - - - - - ECOLOGICAL INFORMATION - - - - - - - - - -

DATA NOT YET AVAILABLE.

SECTION 13. - - - - - - - - - - DISPOSAL CONSIDERATIONS - - - - - - - - - -

BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER BUT EXERT EXTRA CARE IN IGNITING AS THIS MATERIAL IS HIGHLY FLAMMABLE.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - - - - - - TRANSPORT INFORMATION - - - - - - - - - -

CONTACT ALDRICH CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - - - - - - REGULATORY INFORMATION - - - - - - - - - -

EUROPEAN INFORMATION
EC INDEX NO: 602-023-00-7
HIGHLY FLAMMABLE
TOXIC
R 11
HIGHLY FLAMMABLE.
R 45
MAY CAUSE CANCER.
R 23/25
TOXIC BY INHALATION AND IF SWALLOWED.
S 7

KEEP CONTAINER TIGHTLY CLOSED.
S 16
KEEP AWAY FROM SOURCES OF IGNITION - NO SMOKING.
S 53
AVOID EXPOSURE - OBTAIN SPECIAL INSTRUCTIONS BEFORE USE.
S 45
IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).

TLV AND SOURCE
FOR VINYL CHLORIDE:
ACGIH TLV-TWA: 5 PPM (13 MG/M3).
OSHA PEL: 8H TWA 1 PPM; CEILING LIMIT: 5 PPM.

REVIEWS, STANDARDS, AND REGULATIONS
OEL=MAK
ACGIH TLV-CONFIRMED HUMAN CARCINOGEN DTLVS* TLV/BEI,1997
ACGIH TLV-TWA 13 MG/M3 (5 PPM) DTLVS* TLV/BEI,1997
IARC CANCER REVIEW:HUMAN SUFFICIENT EVIDENCE IMEMDT 19,377,1979
IARC CANCER REVIEW:ANIMAL SUFFICIENT EVIDENCE IMEMDT 19,377,1979
IARC CANCER REVIEW:GROUP 1 IMSUDL 7,373,1987
MSHA STANDARD-AIR:TWA 200 PPM (510 MG/M3)
DTLWS* 3,31,1973
OSHA PEL (CONSTRUC):SEE CFR 29,1926.1117
CFRGBR 29,1926.55,1994
OSHA PEL (FED CONT):8H TWA 500 PPM (13 MG/M3)
CFRGBR 41,50-204.50,1994
OSHA-CANCER SUSPECT AGENT
CFRGBR 29,1910.1017,1987
OEL-ARAB REPUBLIC OF EGYPT:TWA 2.5 MG/M3 JAN 1993
OEL-AUSTRALIA:TWA 5 PPM (10 MG/M3);CARCINOGEN JAN 1993
OEL-BELGIUM:TWA 5 PPM (13 MG/M3);CARCINOGEN JAN 1993
OEL-DENMARK:TWA 1 PPM (3 MG/M3);CARCINOGEN JAN 1993
OEL-FINLAND:TWA 5 PPM (15 MG/M3);STEL 10 PPM (30 MG/M3);CARCINOGEN JAN 1993
OEL-FRANCE:TWA 1 PPM (3 MG/M3);CARCINOGEN JAN 1993
OEL-GERMANY;CARCINOGEN JAN 1993
OEL-HUNGARY:STEL 10 MG/M3;CARCINOGEN JAN 1993
OEL-JAPAN:STEL 2.5 PPM;CARCINOGEN JAN 1993
OEL-THE NETHERLANDS JAN 1993
OEL-THE PHILIPPINES:TWA 50 PPM (100 MG/M3) JAN 1993
OEL-POLAND:TWA 30 MG/M3 JAN 1993
OEL-RUSSIA:TWA 1 MG/M3;STEL 2.5 PPM (5 MG/M3) JAN 1993
OEL-SWEDEN:TWA 1 PPM (2.5 MG/M3);STEL 5 PPM (13 MG/M3);SKIN;CARCINOGEN JAN 1993
OEL-SWITZERLAND:TWA 2 PPM (5.2 MG/M3);CARCINOGEN JAN 1993
OEL-THAILAND:TWA 1 PPM (2.8 MG/M3) JAN 1993
OEL-TURKEY:TWA 500 PPM (1300 MG/M3) JAN 1993
OEL-UNITED KINGDOM:TWA 7 MG/M3 JAN 1993
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA CHECK ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM CHECK ACGIH TLV
NIOSH REL TO VINYL CHLORIDE-AIR:CA LOWEST FEASIBLE CONCENTRATION
NIOSH* DHHS #92-100,1992
NOHS 1974: HZD 76445; NIS 22; TNF 1459; NOS 36; TNE 29836
NOES 1983: HZD 76445; NIS 63; TNF 3711; NOS 59; TNE 81314; TFE 28398
ATSDR TOXICOLOGY PROFILE (NTIS** PB/90/103870/AS)
EPA GENETOX PROGRAM 1988, POSITIVE: CARCINOGENICITY-MOUSE/RAT
EPA GENETOX PROGRAM 1988, POSITIVE: IN VIVO CYTOGENETICS-HUMAN LYMPHOCYTE; E COLI POLA WITH S9
EPA GENETOX PROGRAM 1988, POSITIVE: HISTIDINE REVERSION-AMES TEST
EPA GENETOX PROGRAM 1988, POSITIVE: D MELANOGASTER SEX-LINKED LETHAL
EPA GENETOX PROGRAM 1988, POSITIVE: S CEREVISIAE GENE CONVERSION; S

POMBE-FORWARD MUTATION
EPA GENETOX PROGRAM 1988, NEGATIVE: D MELANOGASTER-RECIPROCAL TRANSLOCATION
EPA GENETOX PROGRAM 1988, NEGATIVE: RODENT DOMINANT LETHAL; MOUSE SPOT TEST
EPA GENETOX PROGRAM 1988, NEGATIVE: S CEREVISIAE-HOMOZYGOSIS
EPA TSCA SECTION 8(B) CHEMICAL INVENTORY
EPA TSCA SECTION 8(D) UNPUBLISHED HEALTH/SAFETY STUDIES ON EPA IRIS DATABASE
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JUNE 1998
NIOSH CURRENT INTELLIGENCE BULLETIN 28, 1978
NIOSH ANALYTICAL METHOD, 1994: VINYL CHLORIDE, 1007
NTP 8TH ANNUAL REPORT ON CARCINOGENS, 1998: KNOWN TO BE HUMAN CARCINOGEN
OSHA ANALYTICAL METHOD #04
U.S. INFORMATION
99.8% METHANOL 67-56-1
0.2% VINYL CHLORIDE 75-01-4
THESE PRODUCTS ARE SUBJECT TO SARA SECTION 313 REPORTING REQUIREMENTS.
CALIFORNIA PROPOSITION 65:
THIS PRODUCT IS OR CONTAINS CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

SECTION 16. - - - - - - - - - - OTHER INFORMATION- - - - - - - - - - -

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA, ALDRICH, FLUKA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.

SECTION 1. - - - - - - - - - CHEMICAL IDENTIFICATION- - - - - - - - - -
CATALOG #: 12090
NAME: BENZ(A)ANTHRACENE
SECTION 2. - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - - -
CAS #: 56-55-3
MF: C18H12
EC NO: 200-280-6
SYNONYMS
BENZANTHRACENE * 1,2-BENZANTHRACENE * 1,2-BENZ(A)ANTHRACENE * 1,2-BENZANTHRAZEN (GERMAN) * BENZANTHRENE * 1,2-BENZANTHRENE * BENZOANTHRACENE * BENZO(A)ANTHRACENE * BENZ(A)ANTHRACENE * 1,2-BENZOANTHRACENE * BENZO(B)PHENANTHRENE * 2,3-BENZOPHENANTHRENE * 2,3-BENZPHENANTHRENE * NAPHTHANTHRACENE * RCRA WASTE NUMBER U018 * TETRAPHENE *
SECTION 3. - - - - - - - - - - HAZARDS IDENTIFICATION - - - - - - - - -
LABEL PRECAUTIONARY STATEMENTS
HIGHLY TOXIC (USA)
TOXIC (EU)
MAY CAUSE CANCER.
MAY CAUSE HERITABLE GENETIC DAMAGE.
TOXIC BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.
IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).
DO NOT BREATHE DUST.
WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE PROTECTION.
KEEP CONTAINER TIGHTLY CLOSED IN A COOL WELL-VENTILATED PLACE.
SECTION 4. - - - - - - - - - - FIRST-AID MEASURES- - - - - - - - - - -
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.
CALL A PHYSICIAN.
WASH CONTAMINATED CLOTHING BEFORE REUSE.
SECTION 5. - - - - - - - - - - FIRE FIGHTING MEASURES - - - - - - - - - -
EXTINGUISHING MEDIA
WATER SPRAY.
CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
SECTION 6. - - - - - - - - - ACCIDENTAL RELEASE MEASURES- - - - - - - - -
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL.
AVOID RAISING DUST.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
SECTION 7. - - - - - - - - - - HANDLING AND STORAGE- - - - - - - - - - -
REFER TO SECTION 8.
SECTION 8. - - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION- - - - - -
WEAR APPROPRIATE NIOSH/MSHA-APPROVED RESPIRATOR, CHEMICAL-RESISTANT GLOVES, SAFETY GOGGLES, OTHER PROTECTIVE CLOTHING.
SAFETY SHOWER AND EYE BATH.
USE ONLY IN A CHEMICAL FUME HOOD.
DO NOT BREATHE DUST.
AVOID CONTACT WITH EYES, SKIN AND CLOTHING.
AVOID PROLONGED OR REPEATED EXPOSURE.
WASH THOROUGHLY AFTER HANDLING.
POISON
CARCINOGEN.

MUTAGEN.
KEEP TIGHTLY CLOSED.
STORE IN A COOL DRY PLACE.

SECTION 9. - - - - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - - - - -

APPEARANCE AND ODOR
SOLID.

PHYSICAL PROPERTIES
MELTING POINT: 158 TO 160C

SECTION 10. - - - - - - - - - -STABILITY AND REACTIVITY - - - - - - - - - -

INCOMPATIBILITIES
STRONG OXIDIZING AGENTS

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
TOXIC FUMES OF:
CARBON MONOXIDE, CARBON DIOXIDE

SECTION 11. - - - - - - - - - - TOXICOLOGICAL INFORMATION - - - - - - - - -

ACUTE EFFECTS
MAY BE FATAL IF INHALED, SWALLOWED, OR ABSORBED THROUGH SKIN.
MAY CAUSE IRRITATION.

CHRONIC EFFECTS
CARCINOGEN.
MAY ALTER GENETIC MATERIAL.
TO THE BEST OF OUR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND
TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.

RTECS #: CV9275000
BENZ(A)ANTHRACENE

TOXICITY DATA
IVN-RAT LD50:>200 MG/KG MOPMA3 4,427,1968

TARGET ORGAN DATA
KIDNEY, URETER, BLADDER (BLADDER TUMORS)
SKIN AND APPENDAGES (TUMORS)
TUMORIGENIC (CARCINOGENIC BY RTECS CRITERIA)
TUMORIGENIC (NEOPLASTIC BY RTECS CRITERIA)
TUMORIGENIC (EQUIVOCAL TUMORIGENIC AGENT BY RTECS CRITERIA)
TUMORIGENIC (TUMORS AT SITE OF APPLICATION)
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES
(RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR
COMPLETE INFORMATION.

SECTION 12. - - - - - - - - - - ECOLOGICAL INFORMATION - - - - - - - - - -

DATA NOT YET AVAILABLE.

SECTION 13. - - - - - - - - - - DISPOSAL CONSIDERATIONS - - - - - - - - -

DISSOLVE OR MIX THE MATERIAL WITH A COMBUSTIBLE SOLVENT AND BURN IN A
CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - - - - - - TRANSPORT INFORMATION - - - - - - - - -

CONTACT FLUKA CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - - - - - - REGULATORY INFORMATION - - - - - - - - - -

EUROPEAN INFORMATION
EC INDEX NO: 601-033-00-9
TOXIC
R 45
MAY CAUSE CANCER.
S 53
AVOID EXPOSURE - OBTAIN SPECIAL INSTRUCTIONS BEFORE USE.
S 45
IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE
IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).

REVIEWS, STANDARDS, AND REGULATIONS
OEL=MAK
ACGIH TLV-SUSPECTED HUMAN CARCINOGEN DTLVS* TLV/BEI,1997
IARC CANCER REVIEW:ANIMAL SUFFICIENT EVIDENCE IMEMDT 3,45,1973
IARC CANCER REVIEW:ANIMAL SUFFICIENT EVIDENCE IMEMDT 32,135,1983
IARC CANCER REVIEW:HUMAN NO ADEQUATE DATA IMEMDT 32,135,1983
IARC CANCER REVIEW:GROUP 2A IMSUDL 7,56,1987

OEL-FRANCE;CARCINOGEN JAN 1993
NOES 1983: HZD B0045; NIS 4; TNF 149; NOS 4; TNE 2311
EPA GENETOX PROGRAM 1988, POSITIVE: CARCINOGENICITY-MOUSE/RAT; SHE-CLONAL ASSAY
EPA GENETOX PROGRAM 1988, POSITIVE: CELL TRANSFORM.-MOUSE PROSTATE
EPA GENETOX PROGRAM 1988, POSITIVE: CELL TRANSFORM.-RLV F344 RAT EMBRYO; HOST-MEDIATED ASSAY
EPA GENETOX PROGRAM 1988, POSITIVE: HISTIDINE REVERSION-AMES TEST
EPA GENETOX PROGRAM 1988, POSITIVE: V79 CELL CULTURE-GENE MUTATION
EPA GENETOX PROGRAM 1988, NEGATIVE: CELL TRANSFORM.-BALB/C-3T3; IN VITRO UDS IN RAT LIVER
EPA GENETOX PROGRAM 1988, NEGATIVE: S CEREVISIAE-HOMOZYGOSIS
EPA GENETOX PROGRAM 1988, INCONCLUSIVE: E COLI POLA WITHOUT S9; IN VIVO SCE-NONHUMAN
EPA GENETOX PROGRAM 1988, INCONCLUSIVE: D MELANOGASTER SEX-LINKED LETHAL
EPA GENETOX PROGRAM 1988, INCONCLUSIVE: IN VITRO UDS-HUMAN FIBROBLAST
EPA TSCA SECTION 8(B) CHEMICAL INVENTORY
EPA TSCA SECTION 8(D) UNPUBLISHED HEALTH/SAFETY STUDIES
ON EPA IRIS DATABASE
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JUNE 1998
NIOSH ANALYTICAL METHOD, 1994: POLYNUCLEAR AROMATIC HYDROCARBONS BY HPLC, 5506; BY GC, 5515
NTP 8TH ANNUAL REPORT ON CARCINOGENS, 1998:REASONABLY ANTICIPATED TO BE HUMAN CARCINOGEN

U.S. INFORMATION

THIS PRODUCT IS SUBJECT TO SARA SECTION 313 REPORTING REQUIREMENTS.
CALIFORNIA PROPOSITION 65:
THIS PRODUCT IS OR CONTAINS CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

SECTION 16. - - - - - - - - - - OTHER INFORMATION- - - - - - - - - - -

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA, ALDRICH, FLUKA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.

SECTION 1. - - - - - - - - - CHEMICAL IDENTIFICATION- - - - - - - - - -
CATALOG #: 275336
NAME: BENZ(E)ACEPHENANTHRYLENE, 98%
SECTION 2. - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - - -
CAS #: 205-99-2
MF: C20H12
EC NO: 205-911-9
SYNONYMS
3,4-BENZ(E)ACEPHENANTHRYLENE * 2,3-BENZFLUORANTHENE * 3,4-BENZFLUORANTHENE * BENZO(B)FLUORANTHENE * BENZO(B)FLUORANTHENE (ACGIH) * BENZO(E)FLUORANTHENE * 2,3-BENZOFLUORANTHENE * 3,4-BENZOFLUORANTHENE * 2,3-BENZOFLUORANTHRENE * B(B)F *
SECTION 3. - - - - - - - - - - HAZARDS IDENTIFICATION - - - - - - - - - -
LABEL PRECAUTIONARY STATEMENTS
TOXIC
MAY CAUSE CANCER.
MAY CAUSE HERITABLE GENETIC DAMAGE.
HARMFUL BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.
IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).
WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE PROTECTION.
KEEP CONTAINER TIGHTLY CLOSED IN A COOL WELL-VENTILATED PLACE.
SECTION 4. - - - - - - - - - - FIRST-AID MEASURES- - - - - - - - - - -
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.
CALL A PHYSICIAN.
DISCARD CONTAMINATED CLOTHING AND SHOES.
SECTION 5. - - - - - - - - - FIRE FIGHTING MEASURES - - - - - - - - - -
EXTINGUISHING MEDIA
WATER SPRAY.
CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
UNUSUAL FIRE AND EXPLOSIONS HAZARDS
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.
SECTION 6. - - - - - - - - - ACCIDENTAL RELEASE MEASURES- - - - - - - - -
EVACUATE AREA.
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
WEAR DISPOSABLE COVERALLS AND DISCARD THEM AFTER USE.
SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
SECTION 7. - - - - - - - - - - HANDLING AND STORAGE- - - - - - - - - - -
REFER TO SECTION 8.
SECTION 8. - - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION- - - - - -
WEAR APPROPRIATE NIOSH/MSHA-APPROVED RESPIRATOR, CHEMICAL-RESISTANT GLOVES, SAFETY GOGGLES, OTHER PROTECTIVE CLOTHING.
SAFETY SHOWER AND EYE BATH.
USE ONLY IN A CHEMICAL FUME HOOD.
DO NOT BREATHE DUST.
AVOID ALL CONTACT.
WASH THOROUGHLY AFTER HANDLING.
CARCINOGEN.

MUTAGEN.
KEEP TIGHTLY CLOSED.
STORE IN A COOL DRY PLACE.

SECTION 9. - - - - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - - - -

APPEARANCE AND ODOR
OFF-WHITE TO TAN FIBERS

PHYSICAL PROPERTIES
MELTING POINT: 163 C TO 165 C

SECTION 10. - - - - - - - - - -STABILITY AND REACTIVITY - - - - - - - - -

INCOMPATIBILITIES
STRONG OXIDIZING AGENTS

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
TOXIC FUMES OF:
CARBON MONOXIDE, CARBON DIOXIDE

SECTION 11. - - - - - - - - - - TOXICOLOGICAL INFORMATION - - - - - - - -

ACUTE EFFECTS
HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN.
MAY CAUSE IRRITATION.

CHRONIC EFFECTS
CARCINOGEN.
MAY ALTER GENETIC MATERIAL.
TO THE BEST OF OUR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND
TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.

RTECS #: CU1400000
BENZ(E)ACEPHENANTHRYLENE

TARGET ORGAN DATA
LUNGS, THORAX OR RESPIRATION (TUMORS)
KIDNEY, URETER, BLADDER (KIDNEY TUMORS)
SKIN AND APPENDAGES (TUMORS)
TUMORIGENIC (CARCINOGENIC BY RTECS CRITERIA)
TUMORIGENIC (NEOPLASTIC BY RTECS CRITERIA)
TUMORIGENIC (EQUIVOCAL TUMORIGENIC AGENT BY RTECS CRITERIA)
TUMORIGENIC (TUMORS AT SITE OF APPLICATION)
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES
(RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR
COMPLETE INFORMATION.

SECTION 12. - - - - - - - - - - ECOLOGICAL INFORMATION - - - - - - - - - -

DATA NOT YET AVAILABLE.

SECTION 13. - - - - - - - - - - DISPOSAL CONSIDERATIONS - - - - - - - - -

DISSOLVE OR MIX THE MATERIAL WITH A COMBUSTIBLE SOLVENT AND BURN IN A
CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - - - - - - TRANSPORT INFORMATION - - - - - - - - -

CONTACT ALDRICH CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - - - - - - REGULATORY INFORMATION - - - - - - - - - -

EUROPEAN INFORMATION
EC INDEX NO: 601-034-00-4
TOXIC
R 45
MAY CAUSE CANCER.
S 45
IN CASE OF ACCIDENT OR IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE
IMMEDIATELY (SHOW THE LABEL WHERE POSSIBLE).
S 53
AVOID EXPOSURE - OBTAIN SPECIAL INSTRUCTIONS BEFORE USE.

REVIEWS, STANDARDS, AND REGULATIONS
OEL=MAK
ACGIH TLV-SUSPECTED HUMAN CARCINOGEN DTLVS* TLV/BEI,1997
IARC CANCER REVIEW:ANIMAL SUFFICIENT EVIDENCE IMEMDT 3,69,1973
IARC CANCER REVIEW:ANIMAL SUFFICIENT EVIDENCE IMEMDT 32,147,1983

IARC CANCER REVIEW:HUMAN NO ADEQUATE DATA IMEMDT 32,147,1983
IARC CANCER REVIEW:GROUP 2B IMSUDL 7,56,1987
OEL-FRANCE;CARCINOGEN JAN 1993
OEL-GERMANY;CARCINOGEN JAN 1993
NOES 1983: HZD E0466; NIS 3; TNF 142; NOS 3; TNE 2283
EPA GENETOX PROGRAM 1988, POSITIVE: CARCINOGENICITY-MOUSE/RAT
EPA GENETOX PROGRAM 1988, INCONCLUSIVE: IN VIVO SCE-NONHUMAN
EPA TSCA SECTION 8(D) UNPUBLISHED HEALTH/SAFETY STUDIES
ON EPA IRIS DATABASE
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JUNE 1998
NIOSH ANALYTICAL METHOD, 1994: POLYNUCLEAR AROMATIC HYDROCARBONS BY HPLC, 5506; BY GC, 5515
NTP 8TH ANNUAL REPORT ON CARCINOGENS, 1998:REASONABLY ANTICIPATED TO BE HUMAN CARCINOGEN

U.S. INFORMATION

THIS PRODUCT IS SUBJECT TO SARA SECTION 313 REPORTING REQUIREMENTS.
CALIFORNIA PROPOSITION 65:
THIS PRODUCT IS OR CONTAINS CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

SECTION 16. - - - - - - - - - - OTHER INFORMATION- - - - - - - - - - - -

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA, ALDRICH, FLUKA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.

Product #: 04504 Name: 2-OCTANOL, 97%
MATERIAL SAFETY DATA SHEET, Valid 5/98- 7/98

Aldrich Chemical Co., Inc.
1001 West St. Paul Ave.
Milwaukee, WI 53233 USA
Phone: 414-273-3850

SECTION 1. - - - - - - - - - CHEMICAL IDENTIFICATION- - - - - - - - - -
CATALOG #: 04504
NAME: 2-OCTANOL, 97%
SECTION 2. - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - - -
CAS #: 123-96-6
MF: C8H18O
EC NO: 204-667-0
SYNONYMS
CAPRYL ALCOHOL *
SECTION 3. - - - - - - - - - - HAZARDS IDENTIFICATION - - - - - - - - -
LABEL PRECAUTIONARY STATEMENTS
IRRITANT
RISK OF SERIOUS DAMAGE TO EYES.
IRRITATING TO SKIN.
COMBUSTIBLE.
TARGET ORGAN(S):
NERVES
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.
WEAR SUITABLE PROTECTIVE CLOTHING.
SECTION 4. - - - - - - - - - - FIRST-AID MEASURES- - - - - - - - - - -
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES.
IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH SOAP AND COPIOUS AMOUNTS OF WATER.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.
CALL A PHYSICIAN.
WASH CONTAMINATED CLOTHING BEFORE REUSE.
SECTION 5. - - - - - - - - - - FIRE FIGHTING MEASURES - - - - - - - - - -
EXTINGUISHING MEDIA
CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
WATER SPRAY.
SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
CAUTION:
COMBUSTIBLE.
SECTION 6. - - - - - - - - - ACCIDENTAL RELEASE MEASURES- - - - - - - - -
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
ABSORB ON SAND OR VERMICULITE AND PLACE IN CLOSED CONTAINERS FOR DISPOSAL.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
SECTION 7. - - - - - - - - - - HANDLING AND STORAGE- - - - - - - - - - -
REFER TO SECTION 8.
SECTION 8. - - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION- - - - - -
CHEMICAL SAFETY GOGGLES.
SAFETY SHOWER AND EYE BATH.
RUBBER GLOVES.
MECHANICAL EXHAUST REQUIRED.
NIOSH/MSHA-APPROVED RESPIRATOR.
DO NOT BREATHE VAPOR.
AVOID CONTACT WITH EYES.
AVOID PROLONGED OR REPEATED EXPOSURE.
WASH THOROUGHLY AFTER HANDLING.

SEVERE EYE IRRITANT.
KEEP TIGHTLY CLOSED.
KEEP AWAY FROM HEAT AND OPEN FLAME.
STORE IN A COOL DRY PLACE.

SECTION 9. - - - - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - - - -

APPEARANCE AND ODOR
COLORLESS LIQUID

PHYSICAL PROPERTIES

BOILING POINT:	174 C TO 181 C
FLASHPOINT	160 F 71C
SPECIFIC GRAVITY:	0.819

SECTION 10. - - - - - - - - - -STABILITY AND REACTIVITY - - - - - - - - -

INCOMPATIBILITIES
STRONG OXIDIZING AGENTS

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
TOXIC FUMES OF:
CARBON MONOXIDE, CARBON DIOXIDE

SECTION 11. - - - - - - - - - - TOXICOLOGICAL INFORMATION - - - - - - - -

ACUTE EFFECTS
MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION.
CAUSES SEVERE EYE IRRITATION.
MAY CAUSE SKIN IRRITATION.
PROLONGED EXPOSURE CAN CAUSE:
NAUSEA, DIZZINESS AND HEADACHE

CHRONIC EFFECTS
TARGET ORGAN(S):
NERVES
TO THE BEST OF OUR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.

RTECS #: RH0795000
2-OCTANOL

TOXICITY DATA
UNR-MAM LD50:6934 MG/KG GISAAA 51(5),61,1986
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

SECTION 12. - - - - - - - - - - ECOLOGICAL INFORMATION - - - - - - - - - -

DATA NOT YET AVAILABLE.

SECTION 13. - - - - - - - - - - DISPOSAL CONSIDERATIONS - - - - - - - - -

THIS COMBUSTIBLE MATERIAL MAY BE BURNED IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - - - - - - TRANSPORT INFORMATION - - - - - - - - -

CONTACT ALDRICH CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - - - - - - REGULATORY INFORMATION - - - - - - - - - -

EUROPEAN INFORMATION
IRRITANT
R 41
RISK OF SERIOUS DAMAGE TO EYES.
R 38
IRRITATING TO SKIN.
S 26
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.
S 36
WEAR SUITABLE PROTECTIVE CLOTHING.

REVIEWS, STANDARDS, AND REGULATIONS
OEL=MAK
NOHS 1974: HZD 8 155; NIS 5; TNF 158; NOS 6; TNE 1265
NOES 1983: HZD 82155; NIS 3; TNF 132; NOS 4; TNE 3640; TFE 1361
EPA TSCA SECTION 8(B) CHEMICAL INVENTORY
EPA TSCA SECTION 8(D) UNPUBLISHED HEALTH/SAFETY STUDIES
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, SEPTEMBER 1997

SECTION 16. - - - - - - - - - - OTHER INFORMATION- - - - - - - - - - -

Product #: 04709 Name: 2-OCTANONE, 98%
MATERIAL SAFETY DATA SHEET, Valid 5/98- 7/98

Aldrich Chemical Co., Inc.
1001 West St. Paul Ave.
Milwaukee, WI 53233 USA
Phone: 414-273-3850

SECTION 1. - - - - - - - - - CHEMICAL IDENTIFICATION- - - - - - - - - -
CATALOG #: 04709
NAME: 2-OCTANONE, 98%

SECTION 2. - - - - - COMPOSITION/INFORMATION ON INGREDIENTS - - - - - -
CAS #: 111-13-7
MF: C8H16O
EC NO: 203-837-1

SYNONYMS
HEXYL METHYL KETONE * N-HEXYL METHYL KETONE * METHYL HEXYL KETONE * 2-OXOOCTANE *

SECTION 3. - - - - - - - - - - HAZARDS IDENTIFICATION - - - - - - - - -

LABEL PRECAUTIONARY STATEMENTS
COMBUSTIBLE.

SECTION 4. - - - - - - - - - - FIRST-AID MEASURES- - - - - - - - - - -
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES.
IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH SOAP AND COPIOUS AMOUNTS OF WATER.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN.
WASH CONTAMINATED CLOTHING BEFORE REUSE.

SECTION 5. - - - - - - - - - FIRE FIGHTING MEASURES - - - - - - - - - -

EXTINGUISHING MEDIA
WATER SPRAY.
CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.

SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
COMBUSTIBLE.

SECTION 6. - - - - - - - - ACCIDENTAL RELEASE MEASURES- - - - - - - - -
EVACUATE AREA.
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
ABSORB ON SAND OR VERMICULITE AND PLACE IN CLOSED CONTAINERS FOR DISPOSAL.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

SECTION 7. - - - - - - - - - - HANDLING AND STORAGE- - - - - - - - - - -
REFER TO SECTION 8.

SECTION 8. - - - - - - EXPOSURE CONTROLS/PERSONAL PROTECTION- - - - - -
CHEMICAL SAFETY GOGGLES.
RUBBER GLOVES.
NIOSH/MSHA-APPROVED RESPIRATOR.
SAFETY SHOWER AND EYE BATH.
MECHANICAL EXHAUST REQUIRED.
DO NOT BREATHE VAPOR.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
WASH THOROUGHLY AFTER HANDLING.
KEEP TIGHTLY CLOSED.
KEEP AWAY FROM HEAT AND OPEN FLAME.
STORE IN A COOL DRY PLACE.

SECTION 9. - - - - - - - PHYSICAL AND CHEMICAL PROPERTIES - - - - - - -

APPEARANCE AND ODOR
COLORLESS LIQUID

PHYSICAL PROPERTIES
BOILING POINT: 173 C

MELTING POINT: -16 C
FLASHPOINT 145 F
62C
SPECIFIC GRAVITY: 0.819

SECTION 10. - - - - - - - - -STABILITY AND REACTIVITY - - - - - - - - -

INCOMPATIBILITIES
STRONG OXIDIZING AGENTS
STRONG REDUCING AGENTS
STRONG BASES

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
TOXIC FUMES OF:
CARBON MONOXIDE, CARBON DIOXIDE

SECTION 11. - - - - - - - - - - TOXICOLOGICAL INFORMATION - - - - - - - -

ACUTE EFFECTS
MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION.
MAY CAUSE EYE IRRITATION.
MAY CAUSE SKIN IRRITATION.
TO THE BEST OF OUR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.

RTECS #: RH1484000
2-OCTANONE

IRRITATION DATA

SKN-RBT 500 MG/24H MLD	FCTXAV 13,861,1975

TOXICITY DATA

ORL-RAT LD50:3089 MG/KG	KODAK* #901875
IHL-RAT LC50:>2132 PPM/6H	KODAK* #901875
IPR-RAT LD50:800 MG/KG	38MKAJ 2C,4765,1982
ORL-MUS LD50:3824 MG/KG	TOLED5 30,13,1986
IPR-MUS LD50:800 MG/KG	38MKAJ 2C,4765,1982
UNR-MUS LD50:1600 MG/KG	JMCMAR 19,1257,1976
SKN-RBT LD50:1337 MG/KG	KODAK* #901875

TARGET ORGAN DATA
EFFECTS ON FERTILITY (FEMALE FERTILITY INDEX)
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

SECTION 12. - - - - - - - - - ECOLOGICAL INFORMATION - - - - - - - - -
DATA NOT YET AVAILABLE.

SECTION 13. - - - - - - - - - DISPOSAL CONSIDERATIONS - - - - - - - - -
THIS COMBUSTIBLE MATERIAL MAY BE BURNED IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

SECTION 14. - - - - - - - - - TRANSPORT INFORMATION - - - - - - - - -
CONTACT ALDRICH CHEMICAL COMPANY FOR TRANSPORTATION INFORMATION.

SECTION 15. - - - - - - - - - REGULATORY INFORMATION - - - - - - - - -

REVIEWS, STANDARDS, AND REGULATIONS
OEL=MAK
OEL-RUSSIA:STEL 200 MG/M3 JAN 1993
NOES 1983: HZD X5067; NIS 11; TNF 1222; NOS 38; TNE 18681; TFE 6443
EPA TSCA SECTION 8(B) CHEMICAL INVENTORY
EPA TSCA SECTION 8(D) UNPUBLISHED HEALTH/SAFETY STUDIES
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, SEPTEMBER 1997

SECTION 16. - - - - - - - - - OTHER INFORMATION- - - - - - - - - -
THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA, ALDRICH, FLUKA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.

Please reduce your browser font size for better viewing and printing.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ALCONOX(R)

MSDS Number: A2052 --- *Effective Date: 02/21/00*

1. Product Identification

Synonyms: Proprietary blend of sodium linear alkylaryl sulfonate, alcohol sulfate, phosphates, and carbonates.
CAS No.: Not applicable.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Not applicable to mixtures.
Product Codes: A461

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Alconox(R) proprietary detergent mixture	N/A	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.
Ingestion:
May cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.
Skin Contact:
No adverse effects expected.
Eye Contact:
May cause irritation, redness and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not expected to be a fire hazard.
Explosion:
No information found.
Fire Extinguishing Media:
Dry chemical, foam, water or carbon dioxide.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. When mixed with water, material foams profusely. Small amounts of residue may be flushed to sewer with plenty of water.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Moisture may cause material to cake. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
15 mg/m3 total dust, 5 mg/m3 respirable fraction for nuisance dusts.
- ACGIH Threshold Limit Value (TLV):
10 mg/m3 total dust containing no asbestos and < 1% crystalline silica for Particulates Not Otherwise Classified (PNOC).

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White powder interspersed with cream colored flakes.
Odor:
No information found.
Solubility:
Moderate (1-10%)
Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
No information found.
Conditions to Avoid:
No information found.

---

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Alconox(R) proprietary detergent mixture	No	No	None

12. Ecological Information

Environmental Fate:
This product is biodegradable.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------

Ingredient	TSCA	EC	Japan	Australia
Alconox(R) proprietary detergent mixture	Yes	No	No	No

--------\Chemical Inventory Status - Part 2\---------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Alconox(R) proprietary detergent mixture	No	No	Yes	No

--------\Federal, State & International Regulations - Part 1\---------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Alconox(R) proprietary detergent mixture	No	No	No	No

--------\Federal, State & International Regulations - Part 2\---------

	-RCRA-	-TSCA-

Ingredient	CERCLA	261.33	8(d)
Alconox(R) proprietary detergent mixture	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: No information found.
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **0** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes.
Keep container closed.
Use with adequate ventilation.
Avoid breathing dust.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16.
Disclaimer:
****

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****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

AIR LIQUIDE

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen Balance Gas: Oxygen 0-23.5%; Isobutylene, 0.0005-0.9%

SYNONYMS: Not Applicable
CHEMICAL FAMILY NAME: Not Applicable
FORMULA: Not Applicable
Document Number: 50054

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
SUPPLIER/MANUFACTURER'S NAME:	AIR LIQUIDE AMERICA CORPORATION
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	1-410-228-6400
General MSDS Information	1-713/868-0440
Fax on Demand:	1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Oxygen	7782-44-7	0 - 23.5%	There are no specific exposure limits for Oxygen.					
Isobutylene	115-11-7	0.0005 - 0.9%	There are no specific exposure limits for Isobutylene.					
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

NOTE : All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a colorless, odorless gas. Releases of this product may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated. Isobutylene, a component of this gas mixture, may cause drowsiness and other central nervous system effects in high concentrations; however, due to its low concentration in this gas mixture, this is unlikely to occur.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this product, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. The chief health hazard associated with this gas mixture is when this product contains less than 19.5% Oxygen and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space). Under this circumstance, an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increase, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	1
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
See Section 8			

For routine industrial applications

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. The most significant hazard associated with this gas mixture when it contains less than 19.5% oxygen is the potential for exposure to oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color. Additionally, Isobutylene, a component of this gas mixture, may cause drowsiness or central nervous system effects in high concentrations; however, due to its low concentration in this gas mixture, this is unlikely to occur.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to this gas mixture.

TARGET ORGANS: Respiratory system.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this product, due to the small cylinder size. If any adverse symptom develops after over-exposure to this product, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary.

4. FIRST-AID MEASURES (Continued)

Victim(s) who experience any adverse effect after over-exposure to this product must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

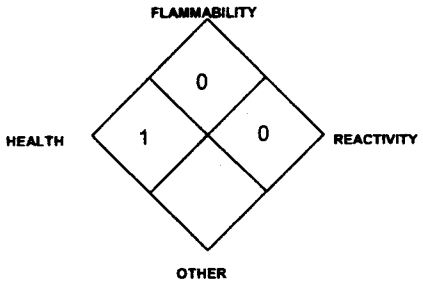
5. FIRE-FIGHTING MEASURES

FLASH POINT, (method): Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):
Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

NFPA RATING



FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of an oxygen deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen. Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue, especially if work is done in a poorly-ventilated area; exposures to fatal concentrations of this product could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C; 70°F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage.

Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this product in well-ventilated areas. If this product is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if oxygen levels are below 19.5% or unknown during emergency response to a release of this product. If respiratory protection is required for emergency response to this product, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards.

EYE PROTECTION: Safety glasses.

HAND PROTECTION: No special protection is needed under normal circumstances of use.

BODY PROTECTION: No special protection is needed under normal circumstances of use.

9. PHYSICAL and CHEMICAL PROPERTIES

Unless otherwise specified, the following information is for Nitrogen, the main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.072 lbs/ ft^3 (1.153 kg/m^3)
BOILING POINT: -195.8°C (-320.4 °F)
FREEZING/MELTING POINT @ 10 psig -210°C (-345.8°F)
SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906 **pH**: Not applicable.
SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023 **MOLECULAR WEIGHT:** 28.01
EVAPORATION RATE (nBuAc = 1): Not applicable. **EXPANSION RATIO**: Not applicable.
ODOR THRESHOLD: Not applicable. **SPECIFIC VOLUME (ft^3/lb)**: 13.8
VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for this gas mixture.
APPEARANCE AND COLOR: This product is a colorless, odorless gas.
HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this product.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Isobutylene include carbon oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this product). Lithium reacts slowly with Nitrogen at ambient temperatures. A component of this product (Isobutylene) are also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen difluoride, and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this product:

NITROGEN: There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

ISOBUTYLENE:
LC_{50} (inhalation, rat) = 620,000 mg/kg/4 hours
LC_{50} (inhalation, mouse) = 415,000 mg/kg

11. TOXICOLOGICAL INFORMATION (Continued)

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: Not applicable.

SENSITIZATION TO THE PRODUCT: This gas mixture is not known to cause sensitization in humans.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for this gas mixture.
Embryotoxcity: No embryotoxic effects have been described for this gas mixture.
Teratogenicity: No teratogenicity effects have been described for this gas mixture.
Reproductive Toxicity: No reproductive toxicity effects have been described for gas mixture.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by over-exposure to the components of this product.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary; treat symptoms; eliminate exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for the components of this gas mixture.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this product.

OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log K_{ow} = -0.65
NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plant and animal life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Non-Flammable Gas
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

14. TRANSPORTATION INFORMATION (Continued)

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: This product is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

COMPONENT	SARA 302	SARA 304	SARA 313
Oxygen	NO	NO	NO
Nitrogen	NO	NO	NO
Isobutylene	NO	NO	NO

SARA THRESHOLD PLANNING QUANTITY: Not applicable.

TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

OTHER U.S. FEDERAL REGULATIONS:

- No component of this product is subject to the requirements of CFR 29 1910.1000 (under the 1989 PELs).
- Isobutylene is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 pounds.
- The regulations of the Process Safety Management of Highly Hazardous Chemicals are not applicable (29 CFR 1910.119).
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR Part 82).
- Nitrogen and Oxygen are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Isobutylene is listed under this regulation in Table 3 as Regulated Substances (Flammable Substances), in quantities of 10,000 lbs (4,553 kg) or greater.

OTHER CANADIAN REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Class A, as per the Controlled Product Regulations.

STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: No.
California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen.
Florida - Substance List: Oxygen, Isobutylene.
Illinois - Toxic Substance List: No.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Oxygen, Isobutylene.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: No.
Missouri - Employer Information/Toxic Substance List: No.
New Jersey - Right to Know Hazardous Substance List: Oxygen, Nitrogen, Isobutylene.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Oxygen, Nitrogen, Isobutylene.
Rhode Island - Hazardous Substance List: Oxygen, Nitrogen.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: : No.

CALIFORNIA PROPOSITION 65: No component of this product is on the California Proposition 65 lists.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. Air Liquide America will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1 *"Safe Handling of Compressed Gases in Containers"*
AV-1 *"Safe Handling and Storage of Compressed Gases"*
"Handbook of Compressed Gases"

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302

Fax on Demand: 1-800/231-1366

AIR LIQUIDE

-----MATERIAL SAFETY DATA SHEET-----

AutoCal Solution

Compliance Technology Inc.
118 Starlite St.
So. San Francisco, CA 94080-6310

Prepared: February 20, 1996
Revised: February 14, 2000

----- NOTICE-----

This information is believed to be accurate and represents the best information currently available to us. however, we make no warranty of merchantability, or fitness for any particular use, or any other warranty, express or implied, with respect to this information, and we assume no liability resulting from the use of this information. Users should make their own investigations to determine the suitability of the information for their particular needs and purposes. Compliance Technology Inc. will assist in this regard.

-----SUBSTANCE IDENTIFICATION-----

SUBSTANCE: AutoCal Solution Calibrating Buffer Solution
Trade names/synonyms: This material is also known by various catalog numbers.
Cercla ratings (scale 0-3): health=0 fire=0 reactivity=0 persistence=0
Nfpa ratings (scale 0-4): health=0 fire=0 reactivity=0

-----COMPONENTS AND CONTAMINANTS---

Component: potassium hydrogen phthalate CAS# 877-24-7 Percent: <2.0
Component: water CAS# 7732-18-5 percent: >98
Other contaminants: none

----- EXPOSURE LIMITS-----

No occupational exposure limits established by osha, acgih or niosh.

-----PHYSICAL DATA-----

Description:
Clear, colorless liquid.
Approx. boiling point: 212°F (100°C). Approx. melting point: 32°F (0°C)
Vapor pressure: 14 torr @20°C Evap. Rate: (ether=1) < 1
pH: 4.0 Solubility in water: complete Vapor density: 0.7 (H2O)

-----FIRE AND EXPLOSION DATA-----

Fire and explosion hazard: No fire hazard when exposed to heat or flame.
Flash point: not applicable
Fire fighting media: dry chemical, carbon dioxide, water spray or regu-lar foam. (1990 emergency response guidebook, dot p-5800.5) For larger fires, use water spray, fog or regular foam. (1990 emergency response guidebook, dot p-5800.5)
Fire fighting: Move container from fire area if it can be done without risk. Do not scatter spilled material with high-pressure water streams. Dike fire-control water for later disposal . (1990 emergency response guidebook, dot p-5800.5 Pg. 31) Use agents suitable for the type of surrounding fire. Avoid breathing hazardous vapors, stay upwind of the fire.

-----TOXICITY-----

potassium hydrogen phthalate:
Carcinogen status: none.
Local effects: irritant - inhalation, skin, eye.
Acute toxicity level: no data available.
Target effects: no data available.
medical conditions agravated by exposure: no data available.

-----HEALTH EFFECTS AND FIRST AID-----

INHALATION

POTASSIUM HYDROGEN PHTHALATE:IRRITANT.
ACUTE EXPOSURE - MAY CAUSE IRRITATION.
CHRONIC EXPOSURE - REPEATED OR PROLONGED EXPOSURE MAY CAUSE IRRITA-TION.
FIRST AID - REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

POTASSIUM HYDROGEN PHTHALATE:IRRITANT.
ACUTE EXPOSURE - MAY CAUSE IRRITATION.
CHRONIC EXPOSURE - REPEATED OR PROLONGED EXPOSURE MAY CAUSE DERMATITIS.
FIRST AID - REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY, WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

POTASSIUM HYDROGEN PHTHALATE: IRRITANT.
ACUTE EXPOSURE-DIRECT CONTACT MAY CAUSE IRRITATION, REDNESS AND PAIN.
CRONIC EXPOSURE-REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS
FIRST AID - WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION

POTASSIUM HYDROGEN PHTHALATE: IRRITANT.
ACUTE EXPOSURE - MAY CAUSE NAUSEA, VOMITING AND DIARRHEA.
CRONIC EXPOSURE - NOT REPORTED TO OCCUR IN HUMANS
FIRST AID - IF VICTIM IS CONSCIOUS, IMMEDIATELY GIVE 2-4 GLASSES OF WATER, AND INDUCE VOMITING BY TOUCHING FINGER TO BACK OF THROAT, GET MEDICAL ATTENTION IMMEDIATELY.

-----REACTIVITY-----

Reactivity: stable under normal temperatures and pressures.
Incompatibilities: AFFECTED BY STRONG OXIDIZERS WHEN DRY.
Decomposition: NONE KNOWN WHILE IN SOLUTION.
Polymerization: NONE KNOWN WHILE IN SOLUTION.

-----STORAGE AND DISPOSAL-----

Observe all federal, state and local regulations when storing or disposing of this substance. for assistance, contact the district director of the environmental protection agency.

-----PROTECTIVE EQUIPMENT-----

When using, wear eye protection to prevent contact.

Please reduce your browser font size for better viewing and printing.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Sulfuric Acid 57%

MSDS Number: S8231 --- ***Effective Date: 04/15/98***

1. Product Identification

Synonyms: Oil of Vitriol,57%; Hydrogen Sulfate,57%
CAS No.: 7664-93-9
Molecular Weight: 98.08
Chemical Formula: H2SO4 in H2O
Product Codes: 9695, 9706

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sulfuric Acid	7664-93-9	43 - 57%	Yes
Water	7732-18-5	43 - 57%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Water Reactive)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.
Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
Eye Contact:
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.

Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing

contaminated clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.
Explosion:
Contact with most metals causes formation of flammable and explosive hydrogen gas. A violent exothermic reaction occurs with water. Sufficient heat may be produced to ignite combustible materials.

Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(R) or TEAM(R) 'Low Na+' acid neutralizers are recommended for spills of this product.

---

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they

retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Sulfuric Acid:
-OSHA Permissible Exposure Limit (PEL):
1 mg/m3 (TWA).
-ACGIH Threshold Limit Value (TLV):
1 mg/m3 (TWA), 3 mg/m3 (STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge and dust/mist filter may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellow liquid.
Odor:
Odorless.
Solubility:
Complete (100%)
Specific Gravity:
1.4508 @ 25C (for 57% solution)
pH:
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
No information found.

Melting Point:
-64C (-83F) (65%)
Vapor Density (Air=1):
3.4
Vapor Pressure (mm Hg):
1 @ 145.8C (295F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.
Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
Conditions to Avoid:
Heat, moisture, incompatibles.

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
Carcinogenicity:
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sulfuric Acid (7664-93-9)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
Environmental Toxicity:
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified; LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.
This material may be toxic to aquatic life.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 12.5LB

International (Water, I.M.O.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 12.5LB

International (Air, I.C.A.O.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 12.5LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Sulfuric Acid (7664-93-9)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sulfuric Acid (7664-93-9)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sulfuric Acid (7664-93-9)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sulfuric Acid (7664-93-9)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: Yes (Mixture / Liquid)

Australian Hazchem Code: 2P
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **2** Other: **Water reactive**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
Label Precautions:

Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 9.

Disclaimer:

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Please reduce your browser font size for better viewing and printing.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID FUMING

MSDS Number: N3662 --- *Effective Date: 11/17/99*

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 90%; Red fuming nitric acid
CAS No.: 7697-37-2
Molecular Weight: 63
Chemical Formula: HNO3
Product Codes:
J.T. Baker: 9624
Mallinckrodt: 2713

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Yellow (Reactive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Symptoms may disappear only to return in a few hours and more severely. Onset of symptoms may be delayed for 4-30 hours.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause severe damage to the eyes. Splashes may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Water spray may be used to keep fire exposed containers cool. Do not get water inside container.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Yellow to brownish-red fuming liquid.
Odor:
Suffocating, acrid.
Solubility:
Infinitely soluble.
Density:
1.5
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
85C (185F)
Melting Point:
ca. -50C (ca. -58F)
Vapor Density (Air=1):
2-3

Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, fuming nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Heat, light, moisture.

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11. Toxicological Information

For Nitric Acid: Oral (human) LDLo: 430 mg/kg; Inhalation,rat, LC50: 67 ppm (NO2)/4H.; Investigated as a mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None

---

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved

waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID, RED FUMING, TOXIC-INHALATION HAZARD ZONE B
Hazard Class: 8, 5.1, 6.1
UN/NA: UN2032
Packing Group: I
Information reported for product/size: 2.5L

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID, RED FUMING
Hazard Class: 8, 5.1, 6.1
UN/NA: UN2032
Packing Group: I
Information reported for product/size: 2.5L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No

Reactivity: Yes (Pure / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **4** Flammability: **0** Reactivity: **1** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
New 16 section MSDS format, all sections have been revised.
Disclaimer:
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FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Hydrochloric Acid 50%
89240

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Hydrochloric Acid 50%
Catalog Numbers:
93580
Synonyms:
Company Identification: Biochemical Sciences, Inc.
100 Clarendon Drive
Swedesboro, NJ 08085
For information, call: 800-524-0294
Emergency Number: 800-524-0294
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
7647-01-0	Hydrochloric Acid	50.0	231-595-7
7732-18-5	Deionized Water	Balance	231-791-2

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: colourless.
Danger! Corrosive. Causes eye and skin burns. Causes digestive and respiratory tract burns.
Target Organs: None known.
Potential Health Effects

Eye:
Causes eye burns. Vapor or mist may cause irritation and severe burns.

Skin:
Causes skin burns.

Ingestion:
Causes gastrointestinal tract burns. May cause corrosion and permanent tissue destruction of the esophagus and digestive tract.

Inhalation:
May cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath and delayed lung edema. Causes chemical burns to the respiratory tract.

Chronic:
Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis. Repeated exposure may cause erosion of teeth.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.

Skin:
Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:
Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:
Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:
Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Not flammable, but reacts with most metals to form flammable hydrogen gas. Use water spray to keep fire-exposed containers cool.

Extinguishing Media:
Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating: Not published.
Explosion Limits, Lower: Not available.
Upper: Not available.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:
Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Large spills may be neutralized with dilute alkaline solutions of soda ash, or lime.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood.

Storage:
Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Hydrochloric Acid	C 5 ppm; C 7.5 mg/m3	50 ppm IDLH	C 5 ppm; C 7 mg/m3
Deionized Water	none listed	none listed	none listed

OSHA Vacated PELs:
Hydrochloric Acid:
No OSHA Vacated PELs are listed for this chemical.
Deionized Water:
No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment
Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin:
Wear appropriate protective gloves to prevent skin exposure.
Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	colourless
Odor:	Pungent
pH:	Not available.
Vapor Pressure:	14 mm Hg @20C
Vapor Density:	0.7
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	212 deg F
Freezing/Melting Point:	Not available.
Decomposition Temperature:	Not available.
Solubility:	Soluble in water.
Specific Gravity/Density:	1.0-1.2
Molecular Formula:	Not available.
Molecular Weight:	Not available.

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:

Incompatible materials, bases.

Incompatibilities with Other Materials:

Hydrochloric acid is incompatible with alcohols, hydrogen cyanide, aluminum, chlorine, dinitroanilines, 1,1-difluoroethylene, fluorine, hexalithium disilicide, metal acetylides or carbides, potassium permanganate, silicon dioxide, sodium, sulfuric acid, tetraselenium tetranitride and calcium carbide, lithium silicide, mercuric sulfate, cesium acetylene carbide, cesium carbide, magnesium boride, rubidium acetylene carbide, and rubidium carbide .

Hazardous Decomposition Products:

Hydrogen chloride, chlorine, carbon monoxide, carbon dioxide, hydrogen gas.

Hazardous Polymerization: Will not occur.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 7647-01-0: MW4025000

CAS# 7732-18-5: ZC0110000

LD50/LC50:

CAS# 7647-01-0: Inhalation, mouse: LC50 =1108 ppm/1H; Inhalation, rat: LC50 =3124 ppm/1H; Oral, rabbit: LD50 = 900 mg/kg.

CAS# 7732-18-5: Oral, rat: LD50 = >90 mL/kg.

Carcinogenicity:

Hydrochloric Acid -

IARC: Group 3 carcinogen

Deionized Water -

Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology:

No data available.

Teratogenicity:

No data available..

Reproductive Effects:

No data available.

Neurotoxicity:

No data available.

Mutagenicity:

No data available.

Other Studies:

No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.
RCRA D-Series Maximum Concentration of Contaminants:
None listed.
RCRA D-Series Chronic Toxicity Reference Levels: None listed.
RCRA F-Series: None listed.
RCRA P-Series: None listed.
RCRA U-Series: None listed.
Not listed as a material banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
No information available
IMO
No information available.
IATA
No information available.
RID/ADR
No information available.
Canadian TDG
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 7647-01-0 is listed on the TSCA inventory.
CAS# 7732-18-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
CAS# 7647-01-0: final RQ = 5000 pounds (2270 kg)
Section 302 (TPQ)
CAS# 7647-01-0: TPQ = 500 pounds; RQ = 5000 pounds (does not meet toxicity criteria but because of high production volume and recognized toxicity is considered a chemical of concern)
SARA Codes
CAS # 7647-01-0: acute.
Section 313
This material contains Hydrochloric Acid (CAS# 7647-01-0, 50 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 7647-01-0 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 7647-01-0 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
CAS# 7647-01-0 is considered highly hazardous by OSHA.
STATE
Hydrochloric Acid can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

Deionized Water is not present on state lists from CA, PA, MN, MA, FL, or NJ.
California No Significant Risk Level:
None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: Not available.
Risk Phrases:
Safety Phrases:

WGK (Water Danger/Protection)

CAS# 7647-01-0: 1
CAS# 7732-18-5: No information available.

Canada

CAS# 7647-01-0 is listed on Canada's DSL/NDSL List.
CAS# 7732-18-5 is listed on Canada's DSL/NDSL List.
WHMIS: Not available.
CAS# 7647-01-0 is not listed on Canada's Ingredient Disclosure List.
CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 7647-01-0: OEL-AUSTRALIA:TWA 5 ppm (7 mg/m3)
OEL-AUSTRIA:TWA 5 ppm (7 mg/m3)
OEL-BELGIUM:STEL 5 ppm (7.7 mg/m3)
OEL-DENMARK:STEL 5 ppm (7 mg/m3)
OEL-FINLAND:STEL 5 ppm (7 mg/m3);Skin
OEL-FRANCE:STEL 5 ppm (7.5 mg/m3)
OEL-GERMANY:TWA 5 ppm (7 mg/m3)
OEL-HUNGARY:STEL 5 mg/m3
OEL-JAPAN:STEL 5 ppm (7.5 mg/m3)
OEL-THE NETHERLANDS:TWA 5 ppm (7 mg/m3)
OEL-THE PHILIPPINES:TWA 5 ppm (7 mg/m3)
OEL-POLAND:TWA 5 mg/m3
OEL-RUSSIA:STEL 5 ppm (5 mg/m3)
OEL-SWEDEN:STEL 5 ppm (8 mg/m3)
OEL-SWITZERLAND:TWA 5 ppm (7.5 mg/m3);STEL 10 ppm (15 mg/m3)
OEL-THAILAND:TWA 5 ppm (7 mg/m3)
OEL-TURKEY:TWA 5 ppm (7 mg/m3)
OEL-UNITED KINGDOM:TWA 5 ppm (7 mg/m3);STEL 5 ppm (7 mg/m3)
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 12/28/1994 Revision #4 Date: 9/30/1997

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

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MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Rod School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ISOBUTYL ALCOHOL

MSDS Number: I7600 --- *Effective Date: 08/02/00*

1. Product Identification

Synonyms: 1-Hydroxymethylpropane; isobutanol; 2-methylpropanol; 2-methyl-1-propanol; Isopropylcarbinol
CAS No.: 78-83-1
Molecular Weight: 74.12
Chemical Formula: (CH3)2 CHCH2OH
Product Codes:
J.T. Baker: 9044, 9047, 9048
Mallinckrodt: 3002

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Isobutyl Alcohol	78-83-1	100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Causes irritation to respiratory tract. Effects from overexposure include headache, dizziness, muscle weakness, drowsiness, incoordination, confusion, and coma. High concentrations can cause central nervous system damage, pulmonary edema, and liver damage. Death may occur from respiratory failure.

Ingestion:
Ingestion may cause nausea, vomiting, and diarrhea. Large doses may cause central nervous system damage, pulmonary edema, and liver damage. Death may occur from respiratory failure.

Skin Contact:
Skin contact causes irritation, redness, and pain. May be absorbed through the skin; symptoms of absorption may be similar to those from ingestion exposure.

Eye Contact:
Vapors cause irritation, redness, and blurred vision. Splashes may cause severe irritation or eye damage.

Chronic Exposure:
Prolonged or repeated skin exposure may cause dermatitis.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.

Skin Contact:
Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Wash clothes before reuse. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: 28C (82F) CC
Autoignition temperature: 415C (779F)
Flammable limits in air % by volume:
lel: 1.7; uel: 10.6
Flammable Liquid and Vapor!
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Containers may explode in heat or fire.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Do not use a solid stream of water, since the stream will scatter and spread the fire. Water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL): 100 ppm (TWA)

-ACGIH Threshold Limit Value (TLV): 50 ppm (TWA)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless solution.
Odor:
Sweet-musty odor.
Solubility:
9.5g/100ml water @ 20C (68F).
Specific Gravity:
0.803
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
108C (226F)
Melting Point:
-108C (-162F)
Vapor Density (Air=1):
2.6

Vapor Pressure (mm Hg):
8.8 @ 20C (68F)
Evaporation Rate (BuAc=1):
0.8

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Burning may produce carbon monoxide, carbon dioxide and isobutylene.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Oxidizing agents, inorganic acids, aldehydes, isocyanates.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Isobutyl alcohol: Oral rat LD50: 2460 mg/kg. Skin rabbit LD50: 3400 mg/kg. Irritation data: Skin rabbit 500 mg/24H moderate. Eye,open, rabbit 2mg severe; Investigated as a tumorigen and a mutagen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Isobutyl Alcohol (78-83-1)	No	No	None

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12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. This material has a log octanol-water partition coefficient of less than 3.0. When released to water, this material is expected to quickly evaporate. When released into water, this material is expected to readily biodegrade. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ISOBUTANOL
Hazard Class: 3
UN/NA: UN1212
Packing Group: III
Information reported for product/size: 20L

International (Water, I.M.O.)

Proper Shipping Name: ISOBUTANOL
Hazard Class: 3.3
UN/NA: UN1212
Packing Group: III
Information reported for product/size: 20L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Isobutyl Alcohol (78-83-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient		--Canada--		
	Korea	DSL	NDSL	Phil.
Isobutyl Alcohol (78-83-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302-		------SARA 313------	
	RQ	TPQ	List	Chemical Catg.
Isobutyl Alcohol (78-83-1)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient		-RCRA-	-TSCA-
	CERCLA	261.33	8(d)

Isobutyl Alcohol (78-83-1)	5000	U140	No

Chemical Weapons Convention: No TSCA 12(b): Yes CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 3[Y]
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **1** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Avoid breathing vapor.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
Avoid contact with eyes, skin and clothing.
Keep away from heat, sparks and flame.
Label First Aid:
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Flush skin with soap or mild detergent and water for at least 15 minutes. Wash contaminated clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In all cases call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
No changes.
Disclaimer:
****

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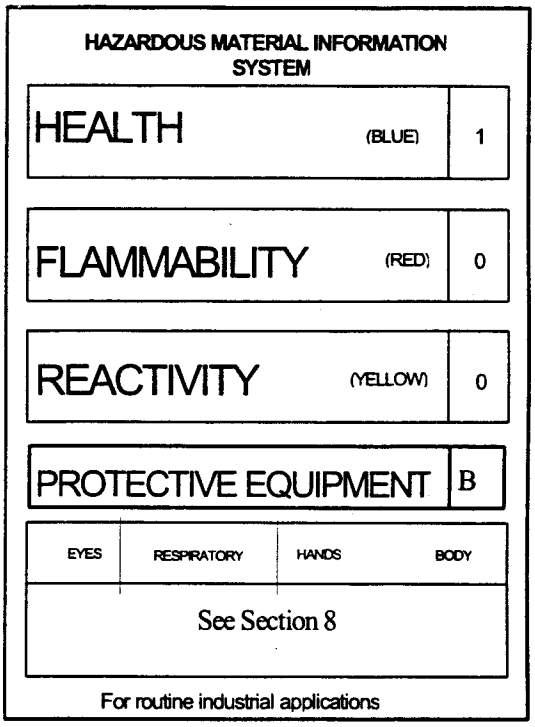
Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a colorless, odorless gas. A significant hazard associated with releases of this product is the potential for over-exposure to Carbon Dioxide, a component of this gas mixture. Inhalation of Carbon Dioxide can increase respiration and heart rate, possibly resulting in circulatory insufficiency (which may lead to coma and death). At concentrations between 2-10%, Carbon Dioxide can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. If the concentration of Carbon Dioxide reaches 10% or more, suffocation can occur within minutes. Additionally, releases of this product may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this product, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. A significant hazard associated with releases of this product is the potential for over-exposure to Carbon Dioxide, a component of this gas mixture. If this product is released in a small, poorly ventilated area (i.e. an enclosed or confined space), and if the concentration of Carbon Dioxide reaches 10% or more, suffocation can occur within minutes. At concentrations between 2-10%, Carbon Dioxide can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. Carbon Dioxide initially stimulates respiration and then causes respiratory depression. High concentrations result in narcosis. Symptoms in humans are as follows:



CONCENTRATION OF CARBON DIOXIDE	OBSERVED EFFECT
1%	Slight increase in breathing rate.
2%	Breathing rate increases to 50% above normal level. Prolonged exposure can cause headache, tiredness.
3%	Breathing increases to twice normal rate and becomes labored. Weak narcotic effect. Impaired hearing, headache, increase in blood pressure and pulse rate.
4-5%	Breathing increases to approximately four times normal rate, symptoms of intoxication become evident and slight choking may be felt.
5-10%	Characteristic sharp odor noticeable. Very labored breathing, headache, visual impairment and ringing in the ears. Judgment may be impaired, followed within minutes by loss of consciousness.
50-100%	Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation.

Additionally, if mixtures of this product contain less than 19.5% Oxygen and are released in a small, poorly-ventilated area (i.e. an enclosed or confined space), an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

3. HAZARD IDENTIFICATION (Continued)

CONTACT WITH SKIN or EYES: Exposure to high concentrations of Carbon Dioxide (a component of this gas mixture) may cause eye irritation with symptoms such as pain, redness, and tearing. Prolonged contact of high concentrations of Carbon Dioxide with the eyes can cause damage to the retinal ganglion cells.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. Inhalation of high concentrations of Carbon Dioxide (a component of this gas mixture) can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. High concentrations of Carbon Dioxide may cause eye irritation, and potential eye damage. Another significant hazard associated with this gas mixture when it contains less than 19.5% oxygen is the potential for exposure to oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to this gas.

TARGET ORGANS: Respiratory system, central nervous system, and eyes.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this product, due to the small cylinder size. If any adverse symptom develops after over-exposure to this product, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary.

Victim(s) who experience any adverse effect after over-exposure to this product must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

5. FIRE-FIGHTING MEASURES

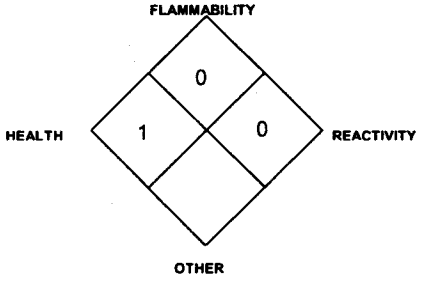
FLASH POINT, (method): Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):
Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

Note: The flammable range for pure Methane in air is 5-15%; however, in a Nitrogen Balance gas, this range is altered and this specific gas mixture is non-flammable.

NFPA RATING



FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire. Pressure in a container can build-up due to heat and it may rupture if pressure relief devices should fail to function.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of Carbon Dioxide over-exposure, an oxygen deficient environment, and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for Carbon Dioxide and oxygen. Carbon Dioxide should not be above background levels and Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this product could occur without any significant warning symptoms, due to Carbon Dioxide over-exposure and oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C, 70°F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage.

Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this product in well-ventilated areas. If this product is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Carbon Dioxide and Oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if the level of Carbon Dioxide exceeds exposure limits presented in Section 2 (Composition and Information of Ingredients) and oxygen levels are below 19.5% or unknown during emergency response to a release of this product. If respiratory protection is required for emergency response to this product, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards. Respiratory selection guidelines from NIOSH for Carbon Dioxide are provided below for information.

NIOSH/OSHA RECOMMENDATIONS FOR CARBON DIOXIDE CONCENTRATIONS IN AIR:

UP TO 40,000 ppm: Supplied Air Respirator (SAR); or full-facepiece Self-Contained Breathing Apparatus (SCBA).

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

ESCAPE: Escape-type SCBA.

NOTE: The IDLH concentration for Carbon Dioxide is 40,000 ppm.

EYE PROTECTION: Safety glasses.

HAND PROTECTION: No special protection is needed under normal circumstances of use.

BODY PROTECTION: No special protection is needed under normal circumstances of use.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Nitrogen, a main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.072 lbs/ ft^3 (1.153 kg/m^3)

BOILING POINT: -320.4 °F (-195.8 °C)

FREEZING/MELTING POINT @ 10 psig -210 °C (-345.8 °F)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906

pH: Not applicable.

SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023

MOLECULAR WEIGHT: 28.01

EVAPORATION RATE (nBuAc = 1): Not applicable.

EXPANSION RATIO: Not applicable.

ODOR THRESHOLD: Not applicable.

SPECIFIC VOLUME (ft^3/lb): 13.8

VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

APPEARANCE AND COLOR: This product is a colorless, odorless gas mixture.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this product. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state. Moisture in the air could lead to the formation of carbonic acid from Carbon Dioxide.

DECOMPOSITION PRODUCTS: Methane, a component of this gas mixture, will thermally decompose in air to generate carbon monoxide and carbon dioxide. The other components of this gas mixture do not decompose, per se, but may react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (a component of this product). Lithium reacts slowly with Nitrogen at ambient temperatures. A component of this product (Methane) is also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen difluoride, and nitrogen trifluoride). Carbon Dioxide, another component of this gas mixture, will ignite and explode when heated with powdered aluminum, beryllium, cerium alloys, chromium, magnesium-aluminum alloys, manganese, thorium, titanium, and zirconium. In the presence of moisture, Carbon Dioxide will ignite with cesium oxide. Metal acetylides will also ignite and explode on contact with Carbon Dioxide.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this product:

NITROGEN: There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

METHANE: There are no specific toxicology data for Methane. Methane is a simple asphyxiant, which acts to displace oxygen in the environment.

CARBON DIOXIDE: This gas is a simple asphyxiant with physiological effects at high concentration.

TCLo(inhalation, rat) = 6 pph/24 hours; reproductive and teratogenic effects
LCLo(inhalation, human) = 9 pph/ 5 minutes
LCLo(inhalation, mammal) = 90,000 ppm/5 minutes

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: Not applicable.

SENSITIZATION TO THE PRODUCT: The components of this gas mixture are not known to be sensitizers.

11. TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not expected to cause mutagenic effects in humans.
Embryotoxcity: This product has not been reported to cause embryotoxic effects.
Teratogenicity: This product is not expected to cause teratogenic effects in humans. Clinical studies involving test animals exposed to high concentrations of Carbon Dioxide indicate teratogenic effects.
Reproductive Toxicity: This product is not expected to cause adverse reproductive effects in humans. Clinical studies involving test animals exposed to high concentrations of Carbon Dioxide indicate reproductive effects.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by over-exposure to the components of this product. Additionally, over-exposure to Carbon Dioxide (a component of this gas mixture) may aggravate eye disorders and central nervous system conditions.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary; treat symptoms and eliminate exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for this gas mixture.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this product.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plant and animal life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Carbon Dioxide)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Non-Flammable Gas
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

14. TRANSPORTATION INFORMATION (Continued)

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: The components of the gas mixture are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

COMPONENT	SARA 302	SARA 304	SARA 313
Methane	NO	NO	NO
Carbon Dioxide	NO	NO	NO
Nitrogen	NO	NO	NO

SARA THRESHOLD PLANNING QUANTITY: Not applicable.

TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

OTHER U.S. FEDERAL REGULATIONS:

- Methane is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 pounds.
- Carbon Dioxide is subject to the reporting requirements of CFR 29 1910.1000. Carbon Dioxide is listed on Table Z.1
- The regulations of the Process Safety Management of Highly Hazardous Chemicals (29 CFR 1910.119) are not applicable to this gas mixture.
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Nitrogen and Carbon Dioxide are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Methane is listed under this regulation in Table 3, as a Regulated Substance (Flammable Substance), in quantities of 10,000 lbs (4,553 kg) or greater.

OTHER CANADIAN REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Classes A and B1, as per the Controlled Product Regulations.

STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Methane, Carbon Dioxide.
California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen, Methane, Carbon Dioxide.
Florida - Substance List: Carbon Dioxide.
Illinois - Toxic Substance List: Carbon Dioxide.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Methane, Carbon Dioxide.
Minnesota - List of Hazardous Substances: Methane, Carbon Dioxide.
Missouri - Employer Information/Toxic Substance List: Methane, Carbon Dioxide.
New Jersey - Right to Know Hazardous Substance List: Nitrogen, Methane, Carbon Dioxide.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Nitrogen, Methane, Carbon Dioxide.
Rhode Island - Hazardous Substance List: Nitrogen, Methane, Carbon Dioxide.
Texas - Hazardous Substance List: Carbon Dioxide.
West Virginia - Hazardous Substance List: Carbon Dioxide.
Wisconsin - Toxic and Hazardous Substances: Carbon Dioxide.

CALIFORNIA PROPOSITION 65: No component of this product is on the California Proposition 65 lists.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. Air Liquide America will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1	*"Safe Handling of Compressed Gases in Containers"*
AV-1	*"Safe Handling and Storage of Compressed Gases"*
	"Handbook of Compressed Gases"

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302

Fax on Demand: 1-800/231-1366

AIR LIQUIDE

AIR LIQUIDE

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen Balance Gas: Oxygen, 0-23.5%; n-Pentane, 0-0.75%; n-Hexane, 0-0.48%

SYNONYMS: Not Applicable
CHEMICAL FAMILY NAME: Not Applicable
FORMULA: Not Applicable
Document Number: 50011

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
SUPPLIER/MANUFACTURER'S NAME:	AIR LIQUIDE AMERICA CORPORATION
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	1-410-228-6400
General MSDS Information	1-713/868-0440
Fax on Demand:	1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER ppm
Oxygen	7782-44-7	0 - 23.5%	There are no specific exposure limits for Oxygen. Oxygen levels should be maintained above 19.5%.					
n-Pentane	109-66-0	0 - 0.75%	600	750	1000 600 (Vacated 1989 PEL)	750 (Vacated 1989 PEL)	1500	NIOSH REL: 120 TWA: 610, C (15 min) DFG MAK: 1000
n-Hexane	110-54-3	0 - 0.48%	50	NE	500 50 (Vacated 1989 PEL)	NE	1100	NIOSH REL: 50 DFG MAK: 50
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a colorless gas mixture which is either odorless, or which has a faint, solvent-like odor, if the solvent components (n-Pentane and n-Hexane) are present. Components of this product (n-Pentane and n-Hexane) can cause anesthetic or peripheral neuropathy effects. Additionally, releases of this product may produce oxygen-deficient atmospheres (especially in small, confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation.

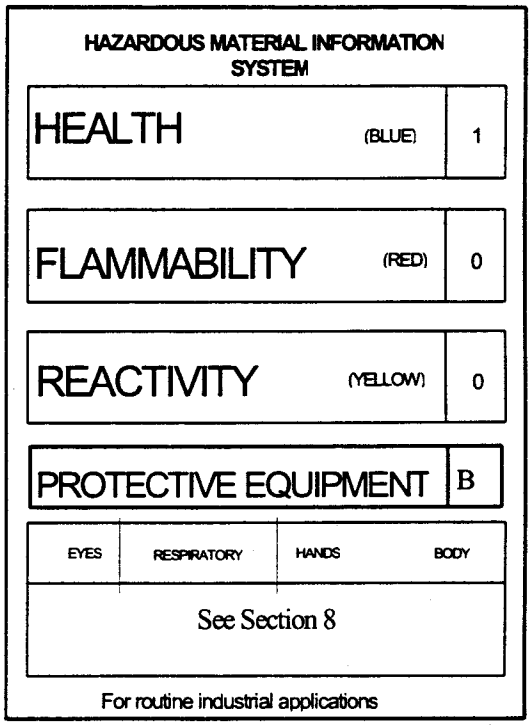
INHALATION: Due to the small size of an individual cylinder of this product, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. A hazard associated with this product is the potential for anesthetic and peripheral neuropathy effects after inhalation over-exposures to n-Pentane and n-Hexane (components of this product). Specific humans over-exposure data are available for n-Pentane and n-Hexane, as follows:

CONCENTRATION OF n-PENTANE	OBSERVED EFFECT
Brief (10 minute) up to 5,000 ppm:	No symptoms.
Higher than 5,000 ppm:	Exhilaration, dizziness and headache can occur.
Long-Term:	Can cause chronic neurological disorder causing damage to the nerves in the hands and feet (peripheral neuropathy).

CONCENTRATION OF n-HEXANE	OBSERVED EFFECT
Brief (10 minute) at 1,500 ppm:	Irritation of the respiratory tract, nausea and headache.
5000 ppm:	Dizziness and drowsiness can occur.
Long term at 500 ppm:	Can affect the nerves in the arms and legs. Effects include numbing or tingling sensations in the fingers and toes, tiredness, muscle weakness, cramps and spasms in the leg, difficulty in holding objects or walking, abdominal pains, loss of appetite, weight loss. More serious exposures can cause damage to the nerves in the hands and feet (peripheral neuropathy).
Eyes and Vision:	Abnormal color perception and pigment changes in the eyes have been reported among industrial workers exposed to 423-1280 ppm for 5 years or more.
Blood Cells:	Mild forms of anemia have also been associated with exposure to hexane. These are of temporary nature.

Additionally, if mixtures of this product contain less than 19.5% Oxygen and are released in a small, poorly ventilated area (i.e. a small, confined space), an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The following effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increased, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.



3. HAZARD IDENTIFICATION (Continued)

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. Inhalation over-exposures to components of this gas mixture (n-Pentane, and n-Hexane) can cause anesthetic effects and motor neuropathy (i.e. pain and tingling in feet and hands).

CHRONIC: Abnormal color perception and pigment changes in the eyes have been reported among persons exposed to 420 -1300 ppm of n-Hexane for five years. Additionally, long-term exposure to low levels of n-Hexane or n-Pentane can affect the nerves in the arms and legs. Effects include numbing or tingling sensation, tiredness, cramps, spasms in legs, difficulty holding objects or walking, loss of appetite and weight loss. Pentane isomers, such as n-Pentane, can cause sensitization of the heart to epinephrine. Refer to Section 11 (Toxicology Information) for additional information on the components of this product.

TARGET ORGANS: Respiratory system, blood system, central nervous system effects, cardiovascular system, reproductive system.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this product, due to the small cylinder size. If any adverse symptom develops after over-exposure to this product, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary.

Victim(s) who experience any adverse effect after over-exposure to this product must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

5. FIRE-FIGHTING MEASURES

FLASH POINT, (method): Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

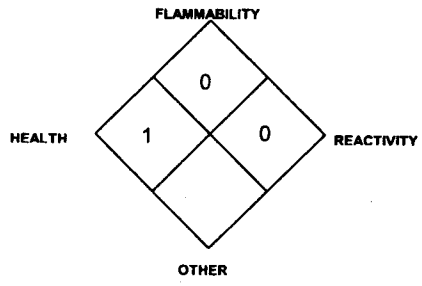
FLAMMABLE LIMITS (in air by volume, %):
Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive.

NFPA RATING



SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of an oxygen deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

6. ACCIDENTAL RELEASE MEASURES (Continued)

For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas mixture to dissipate.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue, especially if work is done in a poorly-ventilated area; exposures to fatal concentrations of this product could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature)approximately 21°C, 70°F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage.

Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this product in well-ventilated areas. If this product is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if oxygen levels are below 19.5% or unknown during emergency response to a release of this product. If respiratory protection is required for emergency response to this product, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards.

EYE PROTECTION: Safety glasses.

HAND PROTECTION: No special protection is needed under normal circumstances of use.

BODY PROTECTION: No special protection is needed under normal circumstances of use.

9. PHYSICAL and CHEMICAL PROPERTIES

Unless otherwise specified, the following information is for Nitrogen, the main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: .072 lbs/ ft^3 (1.153 kg/m^3)

BOILING POINT: -320.4 °F; -195.8 °C

FREEZING/MELTING POINT @ 10 psig -210 °C; -345.8 °F

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906

SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: 64-244 ppm. (for n-Hexane).

VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

pH: Not applicable.

MOLECULAR WEIGHT: 28.01

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft^3/lb): 13.8

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE AND COLOR: This product is a colorless gas which is either odorless, or has a faint, solvent-like odor.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this product.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of n- Hexane and n-Pentane include carbon oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this product). Lithium reacts slowly with Nitrogen at ambient temperatures. Components of this product (n-Pentane and n-Hexane) are also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this product:

NITROGEN: There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

n-PENTANE:
LD_{50} (intravenous, mouse) = 446 mg/kg.
LC_{50} (inhalation, rat) = 364 g/m^3/4 hours
LCLo (inhalation, mouse) = 325 g/m^3/2 hours

n-HEXANE:
Eye, rabbit = 10 mg/ mild
TCLo (inhalation, rat) = 10,000 ppm/7 hr.
TCLo (inhalation, rat) = 5000 ppm/20 hours; teratogenic effects
LD50 (oral, rat) = 28710 mg/kg
LDLo (intraperitoneal, rat) = 9100 mg/kg
LCLo (inhalation, mouse) = 120,000 mg/kg
LD50 (rat, oral): 28,710 mg/kg

ACUTE INHALATION (mouse): 30,000 ppm, narcosis within 30 to 60 minutes; 35,000-40,000 ppm, convulsions and death.

DERMAL (rabbit): 2 to 5 ml/kg for 4 hours resulted in restlessness and discoordination,; death occurred at 5 ml/kg.

CHRONIC INHALATION (rat): 400-600 ppm, 5 days/week, peripheral neuropathy in 45 days; 850 ppm for 143 days, loss of weight and degeneration of the sciatic nerve. (mouse): 250 ppm, peripheral neuropathy within 7 months; no effects at 100 ppm.

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: Not applicable.

SENSITIZATION OF PRODUCT: The components of this gas mixture are not known to be skin or respiratory sensitizers. Pentane isomers (i.e. n-Pentane) can cause cardiac sensitization to epinephrine.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture on the human reproductive system.

Mutagenicity: This gas mixture is not expected to cause mutagenic effects in humans. Animal mutation data are available for n-Hexane obtained during clinical studies on specific animal tissues exposed to high doses of this compound.
Embryotoxicity: This gas mixture is not expected to cause embryotoxic effects in humans.
Teratogenicity: This gas mixture is not expected to cause teratogenic in humans.
Reproductive Toxicity: This gas mixture is not expected to cause adverse reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of n-Hexane indicate adverse reproductive effects.

11. TOXICOLOGICAL INFORMATION (Continued)

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions may be aggravated by over-exposure to this product. Because of the presence of n-Hexane or n-Pentane in this product, central nervous system conditions, eye disorders, or skin problems may be aggravated by over-exposure to this product.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate over-exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Biological Exposure Indices (BEIs) are applicable for this product, as follows:

BIOLOGICAL EXPOSURE INDICES (BEIs) for components of this product are as follows:		
CHEMICAL DETERMINANT	SAMPLING TIME	BEI
n-HEXANE • 2,5-Hexanedione in urine • n-Hexane in end-exhaled air	• End of shift	• 5 mg/g creatinine • Refer to current TLV list.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this product.

OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log K_{ow} = -0.65

PENTANE: Log K_{ow} = 3.39. Water Solubility = 38.5 mg/L. LOG BCF (n-pentane) = calculated, 1.90 and 2.35, respectively. Photolysis, hydrolysis, and bioconcentration are not anticipated to be important fate processes. Biodegradation and soil adsorption are anticipated to be more important processes for this compound.

n-HEXANE: Log K_{ow} = 3.90-4.11. Water Solubility = 9.5 mg/L. Estimated Bioconcentration Factor =2.24 and 2.89. Bioconcentration in aquatic organisms is low. Hexane is volatile. Rapid volatilization from water and soil is anticipated for this compound. Hexane will float in slick on surface of the water

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C; 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plant and animal life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen) ***or*** *(*Nitrogen, n-Pentane)

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

PACKING GROUP: Not applicable.

DOT LABEL(S) REQUIRED: Non-Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

14. TRANSPORTATION INFORMATION (Continued)

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: This product is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

COMPONENT	SARA 302	SARA 304	SARA 313
Oxygen	NO	NO	NO
n-Pentane	NO	NO	NO
n-Hexane	NO	YES	YES
Nitrogen	NO	NO	NO

SARA THRESHOLD PLANNING QUANTITY: Not applicable.

TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): A statutory 1 pound RQ is applicable to n-Hexane until this quantity is adjusted (as a Clean Air Act, Section 112(b) hazardous air pollutant).

OTHER U.S. FEDERAL REGULATIONS:

- n-Pentane and n-Hexane are subject to the reporting requirements of CFR 29 1910.1000. These chemicals are listed on Table Z.1.
- Pentane is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 pounds.
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Nitrogen, Oxygen, and n-Hexane are not listed Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. n-Pentane is listed under this regulation in Table 3 as a Regulated Substance (Flammable), in quantities of 10,000 lbs (4,553 kg) or greater.

OTHER CANADIAN REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Classes A and D2B, as per the Controlled Product Regulations.

STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: n-Pentane, n-Hexane.
California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen, n-Pentane, n-Hexane.
Florida - Substance List: Oxygen, n-Pentane, n-Hexane.
Illinois - Toxic Substance List: n-Pentane, n-Hexane.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Oxygen, n-Pentane, n-Hexane.
Minnesota - List of Hazardous Substances: n-Pentane, n-Hexane.
Missouri - Employer Information/Toxic Substance List t: n-Pentane, n-Hexane.
New Jersey - Right to Know Hazardous Substance List: Oxygen, Nitrogen, n-Pentane, n-Hexane.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Oxygen, Nitrogen, n-Pentane, n-Hexane.
Rhode Island - Hazardous Substance List: Oxygen, Nitrogen, n-Pentane, n-Hexane.
Texas - Hazardous Substance List: n-Pentane, n-Hexane.
West Virginia - Hazardous Substance List: n-Pentane, n-Hexane.
Wisconsin - Toxic and Hazardous Substances: n-Pentane, n-Hexane.

CALIFORNIA PROPOSITION 65: No component of this product is on the California Proposition 65 lists.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. Air Liquide America will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1 *"Safe Handling of Compressed Gases in Containers"*
AV-1 *"Safe Handling and Storage of Compressed Gases"*
"Handbook of Compressed Gases"

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302
Fax on Demand: 1-800/231-1366

AIR LIQUIDE

Appendix B
URS Safety Management Standards

1. Drilling Safety
2. Noise and Hearing Conservation
3. Manual Material Handling
4. Heat Stress
5. Utility Clearance and Isolation
6. Work Zone Traffic Control
7. Injury / Illness /Incident Reporting
8. Vehicle Safety
9. Worker Right –to-Know (Hazard Communication)

URS **SAFETY MANAGEMENT STANDARD**

Drilling Safety Guidelines

1. Applicability

This program applies to URS projects in which truck-mounted or other engine powered drill rigs are used. The primary responsibility for drilling safety is with the drilling contractor.

2. Purpose and Scope

The purpose of this SMS is to provide an overview for working safely around drilling operations with truck-mounted and other engine-powered drill rigs. The procedure addresses off-road movement of drill rigs, overhead and buried utilities, use of augers, rotary and core drilling, and other drilling operations and activities. More detailed drilling safety guidelines are provided in the document "Environmental Remediation Drilling Safety Guideline" that is attached in Section 5.

3. Implementation

Field Activities — Drill rig safety and maintenance is the responsibility of the drill rig operator. URS employees are responsible for their own safety including recognizing and avoiding drill rig hazards. URS employees that observe a drill rig condition believed to be unsafe shall advise the drill rig operator of the unsafe condition. If the drilling firm is a subcontractor to URS, work will be stopped if conditions are determined to be unsafe.

Qualifications — Drilling subcontractors shall be qualified in accordance with SMS 46. The project manager has primary responsibility for the qualification process.

4. Safety Guidelines

A. General Guidelines

URS technicians, geologists, engineers, or other field staff assigned to observe drilling operations or collect soil samples should observe the following guidelines:

- Require a meeting at project start-up regarding the drill rig operator responsibility for rig safety and any site and equipment specific safety requirements
- Set up any sample tables and general work areas for the URS field staff to the side of the drill rig (preferably 10 meters away) and not directly behind the rig.

- URS engineers, technician, and geologists shall not assist the drillers with the drilling equipment or supplies and shall not at any time operate the drill rig controls.

B. Movement of Drill Rigs

Before moving a rig, the operator must do the following:

- To the extent practical, walk the planned route of travel and inspect it for depressions, gullies, ruts, and other obstacles.
- Check the brakes of the truck/carrier, especially if the terrain along the route of travel is rough or sloped.
- Discharge all passengers before moving on rough or steep terrain.
- Engage the front axle (on 4x4, 6x6, etc. vehicles) before traversing rough or steep terrain.

Driving drill rigs along the sides of hills or embankments should be avoided; however, if side-hill travel becomes necessary, the operator must conservatively evaluate the ability of the rig to remain upright while on the hill or embankment. The possibility must be considered that the presence of drilling tools on the rig may reduce the ability of the rig to remain upright (raises the center of mass of the rig).

Logs, ditches, road curbs, and other long and horizontal obstacles should be normally approached and driven over squarely, not at an angle.

When close lateral or overhead clearance is encountered, the driver of the rig should be guided by another person on the ground.

Loads on the drill rig and truck must be properly stored while the truck is moving, and the mast must be in the fully lowered position.

After the rig has been positioned to begin drilling, all brakes and/or locks must be set before drilling begins. If the rig is positioned on a steep grade and leveling of the ground is impossible or impractical, the wheel of the transport vehicle should be blocked and other means of preventing the rig from moving or topping over employed.

C. Buried and Overhead Utilities

The location of overhead and buried utility lines must be determined before drilling begins, and the locations should be noted on boring plans and/or assignment sheets.

When overhead power lines are close by, the drill rig mast should not be raised unless the distance between the rig and the nearest power line is at

least 20 feet (7 meters) or other distance as required by local ordinances, whichever is greater. The drill rig operator or assistant should walk completely around the rig to make sure that proper distance exists.

When the drill rig is positioned near an overhead line, the rig operator should be aware that hoist lines and power lines can be moved towards each other by wind. When necessary and approved by the Project Manager (PM), the utility and/or power lines may be shielded, shut down, or moved by the appropriate personnel.

For additional information, please refer to SMS 34 "Utility Clearances and Isolation".

D. Clearing the Work Area

Before a drill rig is positioned to drill, the area on which the rig is to be positioned should be cleared of removable obstacles and the rig should be leveled if sloped. The cleared/leveled area should be large enough to accommodate the rig and supplies.

E. Safe Use of Augers

Never place hands or fingers under the bottom of an auger flight or drill rods when hoisting the augers or rods over the top of another auger or rod in the ground or other hard surfaces, such as the drill rig platform.

Never allow feet to get under the auger or drill rod while they are being hoisted.

When the drill is rotating, stay clear of the drill string and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.

Move auger cuttings away from the auger with a long-handled shovel or spade; never use hands or feet.

Never clean an auger attached to the drill rig unless the transmission is in neutral or the engine is off, and the auger has stopped rotating.

Do not wear loose clothing or jewelry while working near the drill rig. Long hair must be pulled back to avoid entanglement with moving parts.

Hearing protection is required when working near an operating drill rig.

F. Rod Separation

Use of manual tools (e.g. pipe wrenches) in combination with rotation of the drill stem is not permitted. Manual tools are not designed for the load, and may break. The tool also creates a significant impact hazard for

those in the work area as it rotates with the drill stem. URS does not permit drillers to use manual tools (e.g. pipe wrenches) in combination with a rotating drill stem to break rods. Manual tools may be used if the drill stem is isolated/positively disengaged.

Mechanical means of rod separation that are permitted include:

- Opposing hydraulic controls
- Rod locking devices
- Hydraulic breakout tools
- Hydraulic foot clamps

G. Safe Use of Hand Tools

Regulations regarding hand tools should be observed in addition to the guidelines provided below:

- Each tool should be used only to perform tasks for which it was originally designed.
- Damaged tools should be repaired before use or discarded.
- Safety goggles or glasses should be worn when using a hammer or chisel. Nearby co-workers and by-standers should be required to wear safety goggles or glasses also, or move away.
- Tools should be kept cleaned and stored in an orderly manner when not in use.

H. Safe use of Wire Line Hoists, Wire Rope, and Hoisting Hardware

Safety rules described in Title 29 Code of Federal Regulations (CFR) 1926.552 and guidelines contained in the Wire Rope User's Manual published by the American Iron and Steel Institute shall be used whenever wire line hoists, wire rope, or hoisting hardware are used. The driller should provide written reports (upon request) documenting inspections of equipment.

I. Traffic Safety

Drilling in streets, parking lots or other areas of vehicular traffic requires definition of the work zones with cones, warning tape, etc. and compliance with local police requirements. Refer to SMS 32 “Work Zone Traffic Control”.

J. Fire Safety

- Fire extinguishers (type ABC) shall be kept on or near drill rigs for fighting small fires.
- If methane or other flammable gases or vapors are suspected in the area, a combustible gas indicator (CGI) shall be used to monitor the air near the borehole with all work to stop at 20 percent of the Lower Explosive Limit (LEL).
- Work shall stop during lightning storms.

K. Drilling at Potential MEC/UXO Sites

If the project site is suspected of munitions and explosives of concern (MEC) or unexploded ordnance (UXO) contamination, the UXO team will conduct a reconnaissance and MEC/UXO avoidance to provide clear access routes to each site prior to drilling crews entering the area. The following procedures will be implemented:

- Drilling operations on MEC/UXO sites will not be conducted until a complete plan for the site is prepared and/or approved by the URS UXO Safety Officer. MEC/UXO avoidance must be conducted during drilling operations on known or suspect MEC/UXO sites (SMS-039).
- The UXO team will identify, and clearly mark the boundaries of a clear approach path for the drilling crews, vehicles, and equipment to enter the site. This path will be, at a minimum, twice the width of the widest vehicle. No personnel will be allowed outside any marked boundary.
- If MEC/UXO is encountered on the ground surface, the UXO team will clearly mark the area where it is found, report it to the proper authorities, and divert the approach path around it.
- The UXO team will conduct an access survey using the appropriate geophysical instrument over the approach path for avoidance of MEC/UXO that may be in the subsurface. If a magnetic anomaly is encountered, it will be assumed to be MEC/UXO and the approach path will be diverted around the anomaly. UXO personnel only will operate the appropriate geophysical instrument and identify MEC/UXO.
- An incremental geophysical survey of the drill hole location(s) will be initially accomplished by the UXO team using a hand auger to install a pilot hole. If MEC/UXO is encountered or an anomaly cannot be positively identified as inert material, HTRW sampling personnel will select a new drill hole location.

- Once a drilling site has been surface cleared and a pilot hole established as described above, the drilling contractor will be notified that the site is available for subsurface drilling.
- Additional guidance for MEC/UXO support during drilling activities is provided in URS SMS 039.

L. Protective Gear

1. Minimum Protective Gear

Items listed below should be worn by all staff working within 30 feet (10 meters) of drilling activities.

- Hearing Protection;
- Hard Hat;
- Eye Protection (safety glasses, goggles, or face-shield)
- Safety Shoes (shoes or boots with steel toes)

2. Other Gear

Items listed below should be worn when conditions warrant their use. Some of the conditions are listed after each item.

- **Safety Harnesses and Lifelines:** Safety harnesses and lifelines shall be worn by all persons working on top of an elevated derrick beam or mast. The lifeline should be secured at a position that will allow a person to fall no more than six feet (2 meters). OSHA Fall Protection (1926 Subpart M) requirements apply.
- **Life Vests**: Use for work over water.

5. Resources

A. International Association of Drilling Contractors Safety Alerts http://iadc.org/alerts.htm

B. Fall Protection - SMS 040

C. Hearing Conservation - SMS 026

D. Subcontractor Health and Safety Requirements - SMS 046

E. Utility Clearances and Isolation - SMS 034

F. Munitions Response / Munitions and Explosives of Concern - SMS 039

G. Environmental Remediation Drilling Safety Guideline

URS **SAFETY MANAGEMENT STANDARD**

Noise and Hearing Conservation

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies where personnel may encounter noise exposures that may exceed 85 decibels, measured using an "A" weighted scale (dBA), as an 8-hour time weighted average (TWA).

For non U.S. operations, refer to the country/region specific SMS and regulations.

2. Purpose and Scope

The purpose of this procedure is to protect employees from hazardous noise exposures and to prevent hearing loss.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. General

The use of hearing protectors is required in any location where powered or motorized equipment or any other noise source could reasonably be expected to exceed 85 dBA. Use of hearing protectors may only be discontinued when noise levels are verified to be less than 85 dBA through a properly conducted noise survey. Whenever information indicates that any employee's exposure may equal or exceed an 8-hour TWA of 85 dBA, the project manager or location manager will be responsible to enforce the proper use of hearing protectors.

B. Hearing Protectors

1. Require that at least two (2) types of hearing protectors are available to employees free of charge, preferably a plug and a muff type.

2. Minimum Noise Reduction Ratings (NRR)

   Hearing protectors issued must have the following minimum NRR:

Ear Plug	Muffs
29 dBA	27 dBA

3. Require that hearing protectors are used in accordance with manufacturer's specifications and thus effectively protect hearing.

C. Noise Surveys

1. Noise surveys must be conducted in a manner that reasonably reflects the exposure of the affected employees. Surveys must be conducted under the supervision of a URS Health, Safety, and Environment (HSE) Representative.

2. Sound level meters and audio dosimeters used to determine employee exposure to noise sources must be Type II (accurate to within +/- 2 dBA), operated in "slow" response, on the "A" scale, and be calibrated to factory guidelines (including periodic factory recalibration).

D. Noise Controls

Eliminate noise sources to the extent possible. Examples of controls that must be considered include:

1. Addition or replacement of mufflers on motorized equipment.

2. Addition of mufflers to air exhausts on pneumatic equipment.

3. Following equipment maintenance procedures to lubricate dry bearings.

4. Isolation of loud equipment with barriers.

5. Replacement of loud equipment with newer and quieter models.

E. Audiometric Exams

1. Tests

   Details on the medical surveillance program (including audiometric testing) are included in SMS 24.

Audiometric tests shall be performed by a person meeting the requirements described in 29 CFR 1910.95(g)(3). Within 6 months of an employee's first exposure at or above the action level, a valid baseline audiogram shall be established against which subsequent audiograms can be compared. Testing to establish a baseline audiogram shall be preceded by 14 hours without exposure to noise. Hearing protectors may be used as a substitute for the requirement that baseline audiogram shall be preceded by 14 hours without exposure to workplace noise. The medical surveillance provider shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination. For multi-year projects, an annual audiogram shall be obtained for each employee exposed at or above an 8-hour time-weighted average of 85 decibels.

Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if there is a standard threshold shift (STS). A standard threshold shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear. If the annual audiogram shows that an employee has suffered a STS, the employer will obtain a retest within 30 days and consider the results in assessing an STS as the annual audiogram. The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. If an STS has occurred, the medical surveillance provider will notify the employee within 21 days of the determination.

2. Standard Threshold Shifts

   If an employee's test results show a confirmed STS, their hearing protection will be evaluated and refitted, and a medical evaluation may be required.

F. Training

Verify that each employee who must work in a noisy environment is current on required Hearing Conservation Training. Training must include the following topics:

1. The effects of noise on hearing.

2. The purpose of hearing protectors.
3. The advantages and disadvantages of various types of hearing protectors.
4. The attenuation of various types of hearing protection.
5. The selection, fitting, care, and use of hearing protectors.
6. The purpose of audiometric testing.
7. An explanation of the audiometric testing procedure.

5. Documentation Summary

A. File these records in the Safety Filing System:

1. Noise surveys, when applicable.
2. Training Records.

6. Resources

A. U.S. OSHA Standard – Occupational noise exposure – 29 CFR 1910.95

B. U.S. OSHA Construction Standard – Occupational noise exposure – 29 CFR 1926.52

C. U.S. OSHA Technical Links - Noise and Hearing Conservation

D. American Industrial Hygiene Association: The Occupational Environment – Its Evaluation and Control, Chapter 20. Fairfax, VA: 1997

E. National Hearing Conservation Association web site

F. URS SMS 24 - Medical Screening and Surveillance

URS SAFETY MANAGEMENT STANDARD
Manual Material Handling

1. Applicability

This standard applies to URS operations where personnel perform manual handling of materials. For this procedure, manual material handling (MMH) is defined as the movement of items by lifting, lowering, pushing, pulling, carrying, holding, or restraining.

2. Purpose and Scope

The purpose of this procedure is to prevent common injuries caused by the practice of MMH. Immediate or short-term effects include lacerations, bruises, and muscle fatigue. Long-term effects include chronic pain, typically in the lower back.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure

4. Requirements

A. General

1. Prior to lifting, lowering, pushing, pulling, carrying, holding, or restraining an object of any significant size or weight, employees must evaluate the object and the required task to determine if they can handle the object safely.
2. If the employee has any doubt about whether than can safely move the object by themselves, additional manual or mechanical help should be obtained.
3. Healthy employees with no physician imposed restrictions should lift and carry a maximum of 50 pounds (23 kilograms) using proper lifting and carrying techniques. Physical and workplace factors may reduce this recommended weight limit (RWL) significantly and should be considered prior to attempting lifts of this magnitude.
4. An employee's personal "safe" MMH capability is defined as the employee's personal capability to manually lift, carry, push, or pull an object alone. This "safe" limit must consider the employee's past experience and training with MMH, health status, and any other personal or environmental characteristics affecting the

employee's ability to perform these tasks. An employee's "safe" MMH capability is typically at or below the calculated RWL.

5. An MMH task that exceeds an employee's personal "safe" MMH capability or RWL should be brought to the attention of the applicable Manager.
6. If, due to a medical or health condition, the employee's physician or the employee has set a personal "safe" MMH capability, then appropriate medical documentation must be provided to the applicable Manager to define these limits.
7. A recommended RWL can be calculated using the factors described in Attachment 69-1. The weight limit derived from these calculations is considered to be a load that over 99% of men and over 75% of women can safely handle without application of engineering or administrative controls. **Implementation of the calculations in Attachment 69-1 should only be attempted with the assistance of a safety professional knowledgeable in the application of these factors. The calculations are intended to determine RWLs for repetitive lifting scenarios rather than occasional lifts.**

B. Pre-Planning

1. If a heavy object is to be moved to another location, the safest transport route should be determined prior to the activity.
2. The area around the object and the route over which it will be transported should be checked for slip, trip, and fall hazards. Hazards should be removed prior to initiation of the task.
3. The object to be moved should be inspected for grasping or handling hazards, including slivers, sharp edges, grease, water, etc. Eliminate or abate any identified hazards where possible. Safe grasping or handling points on the object should be determined.
4. The distance to be traveled and the length of time which a grip on the object must be maintained should be considered before moving objects.

C. Lifting/Lowering Guidelines

1. Reduce or eliminate manual lifting and lowering tasks where possible. Determine if there are ways to abate the safety and ergonomic hazards associated with manual lifting.

2. The recommended technique for manual lifting/lowering involves five maneuvers:
    a. Get a firm footing. Keep your feet apart for a stable base. Put one foot slightly in front of the other.
    b. Bend your knees. Do not bend at the waist. When grasping the object, a firm grip should be obtained before lifting/lowering.
    c. Lift/lower with your legs. Lift/lower the load slowly and in a straight line, avoiding sudden movements.
    d. Keep the load close to the body. Generally, the closer the load is to the body, the less force it exerts on your back.
    e. Keep your back straight. Do not add the weight of your body to the load. Avoid twisting.
3. When a turn or change of direction is necessary, the object should be lifted or lowered into a carrying position, then the whole body should be turned with the feet, avoiding any trunk twisting motion.
4. Objects to be lifted to shoulder height should first be lifted to waist height, then rested on a level surface so the grasping position can be changed prior to lifting to a higher level.
5. Employees should never lift a load above their head.

D. Carrying/Holding Guidelines

1. Manual carrying is an inefficient way of transporting materials in the work place. Where possible, reduce or eliminate manual carrying tasks.
2. Employees should never carry a load above their head.
3. Carry an object close to the body using both hands. One-handed carries are awkward and tend to unbalance the employee.
4. Do not carry objects that are so large they will obstruct visibility.
5. Grips on an object should not be changed while carrying or holding an object. Rest the object on a secure surface prior to changing grip.
6. Avoid two person carries where possible. If an object is of a size, shape, or mass that it requires two people to carry, use two people of similar size and physique. Perform lifting of the item in unison.
7. Avoid carrying objects on stairs, particularly where the line of sight may be obstructed or the object can interfere with leg movement.

E. Pushing/Pulling Guidelines

1. Check the condition of the floor, ground, or other surface prior to pushing or pulling an object across it.
2. Be aware of the “break out” force of the object - the force at which a push or pull overcomes the frictional force between the surface and object. Adjust posture to avoid losing balance when this point is reached.
3. Get assistance when moving or guiding a large load.
4. Where possible, always push rather than pull a load.

F. Workplace Design

1. Store heavy or bulky materials at heights between the knee and shoulder to avoid the need to stretch or bend.
2. Pack or arrange items to be lifted to avoid shifting of weight in the package.
3. Design work areas to avoid the need to lift, carry, push, or pull heavy or bulky materials for extended distances.
4. Design workplaces with the following in mind.
   a. Lifts from the floor should be avoided.
   b. The torso should never twist while handling loads.
   c. Asymmetrical or unbalanced one-handed lifts should be avoided.
   d. Loads should not be lifted with sudden movements.
   e. Loads should not be lifted over obstacles.
   f. Loads should not be lifted at extended reaches.
   g. Uncomfortable postures should not be necessary throughout the work cycle.
   h. Environmental factors (e.g., task lighting, dry work surfaces, heat stress) should be considered.

G. Training

1. Require that personnel who may have MMH as part of their duties receive training that includes the following topics:
   a. Showing personnel how to avoid unnecessary physical stress and strain during MMH operations.

b. Teaching personnel to become aware of what they can comfortably handle without undue strain.

c. Instructing personnel on the proper use of equipment.

d. Teaching personnel to recognize potential hazards and how to prevent or correct them.

2. This training must be completed prior to an employee being assigned to a task that involves MMH activities.

5. Documentation Summary

Training rosters or other proof of completion of MMH training will be filed in the Health and Safety File.

6. Resources

A. Recommended Weight Limit Calculations (RWL) – Attachment 69-1

B. Work Practices Guide for Manual Lifting, NIOSH
http://www.cdc.gov/niosh

C. Canadian Centre for Occupational Health and Safety
http://www.ccosha.ca/oshaanswers/ergonomics/mmh/

D. Oregon OSHA “Ergonomics of Manual Materials Handling”
http://www.cbs.state.or.us/external/osha/pdf/workshops/206w.pdf

E. North Carolina Department of Labor “A Guide to Manual Materials Handling and Back Safety
http://www.nclabor.com/osha/etta/indguide/ig26.pdf

F. European Agency for Safety and Health at Work
http://uk.osha.eu.int/good_practice/msd.stm

URS **SAFETY MANAGEMENT STANDARD**

Heat Stress

1. Applicability

This procedure applies to URS field projects where ambient (not adjusted) temperatures exceed 70°F (21°C) for personnel wearing chemical protective clothing, including Tyvek coveralls, and 90°F (32°C) for personnel wearing normal work clothes.

2. Purpose and Scope

The purpose of this procedure is to protect project personnel from the effects of heat related illnesses.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager.

4. Requirements

A. Monitor ambient temperatures and conduct heat stress monitoring when threshold temperatures (see Section 1) are reached.

B. Conduct initial monitoring to determine first rest break.

1. Measure the air temperature with a standard thermometer with the bulb shielded from radiant heat; this yields T (actual).

2. Estimate the fraction of sunshine by judging what percent time the sun is not shielded by clouds that are thick enough to produce a shadow, as follows:

   a. 100 percent sunshine (e.g., no cloud cover) = 1.0

   b. 50 percent sunshine (e.g., 50 percent cloud cover) = 0.5

   c. 0 percent sunshine (e.g., full cloud cover) = 0.0

3. Plug these variables into the following equation to determine the adjusted temperature:

   T (adjusted) = T (actual) + (13 x fraction sunshine)

C. Body Temperature Monitoring

1. Monitor oral body temperature to determine if employees are adequately dissipating heat buildup. Ear probe thermometers which are adjusted to oral temperature are convenient and the preferred method of measurement. Determine work/rest regimen as follows:

    a. Measure oral body temperature at the end of the work period.

    b. If temperature exceeds 99.6 ^{o}F (37.5 ^{o}C), shorten the following work period by 1/3 without changing the rest period.

    c. If temperature still exceeds 99.6 ^{o}F (37.5 ^{o}C), shorten the following work period by 1/3.

    d. Do not allow a worker to wear impermeable PPE when his/her oral temperature exceeds 100.6 ^{o}F (38.1^{o}C).

2. Oral body temperatures are to be obtained prior to the employee drinking water or other fluids.

D. Pulse Rate Monitoring

1. Take the radial (wrist) pulse as early as possible in the rest period.

    a. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third.

    b. If the heart rate still exceeds 110 beats per minute at the next rest cycle, shorten the following work cycle by an additional one-third.

E. Record monitoring results on Heat Stress Monitoring Form (Attachment 18-2).

F. Investigate the use of auxiliary cooling devices in extreme heat conditions.

G. Conduct briefings for employees regarding health hazards and control measures associated with heat stress whenever conditions require the implementation of heat stress monitoring. Review the information provided in Attachment 18-3.

H. Provide water and electrolyte replacement drinks fluids as described in Attachment 18-3.

I. Allow employees who are not accustomed to working in hot environments appropriate time for acclimatization (see Attachment 18-3).

J. Provide break areas as described in Attachment 18-3.

5. Documentation Summary

File these records in the Project Safety File.

A. Heat Stress Monitoring Forms.

B. Employee Safety Briefing Verification Forms.

6. Resources

A. NIOSH - "Working in Hot Environments"

B. AFL-CIO Building Trades Division - "Heat Stress in Construction"

C. Attachment 18-1 - Initial Work Monitoring Cycles

D. Attachment 18-2 - Heat Stress Monitoring Record

E. Attachment 18-3 -Informational Supplement

URS SAFETY MANAGEMENT STANDARD

Utility Clearances And Isolation

1. Applicability

This procedure applies to URS projects where personnel may encounter subsurface or overhead utilities.

2. Purpose and Scope

Many field activities are conducted near aboveground and underground utilities. The primary purpose of this Standard is to establish operating requirements that will permit employees to work safely in the vicinity of electrical, natural gas, fuel, water, and other utility systems and installations. The secondary purpose is to prevent economic damage to utility systems from operations associated with project-related activities.

The term "utility clearance" includes

A. The positive locating of utility systems in or near the work area.

B. A signed statement by an appropriate representative attesting to the location of underground utilities and/or the positive de-energizing (including lockout) and testing of electrical utilities.

Note that in some cases, utility representatives may deem it appropriate or necessary to use insulating blankets to isolate a power line. This is an acceptable alternative to positive de-energizing; however, only utility representatives can make the determination.

"Contact" with overhead power lines is considered to occur when equipment is closer to power lines than permitted by the criteria in the table in Section 4.0.C.2.b below. (See note for U.K. operations).

3. Implementation

Field Operations - Implementation of this procedure is the responsibility of the Project Manager.

4. Requirements

A. Time for Completion

Complete utility clearances prior to the start of any work in the area of the utility that could feasibly result in contact with or damage to that utility.

B. Local Regulations

Research local and state codes and regulations regarding utility locating and isolation requirements. Utility companies and locating services are among the appropriate resources.

C. Overhead Power Lines

1. Proximity to Power Lines

   No work is to be conducted within 50 feet (15 meters) of overhead power lines without first contacting the utility company to determine the voltage of the system. No aspect of any piece of equipment is to be operated within 50 feet (15 meters) of overhead power lines without first making this determination.

2. Operations adjacent to overhead power lines are **PROHIBITED** unless one of the following conditions is satisfied:

   a. Power has been shut off, positive means (such as lockout) have been taken to prevent the lines from being energized, lines have been tested to confirm the outage, and the utility company has provided a signed certification of the outage.

   b. The minimum clearance from energized overhead lines is as shown in the table below, or the equipment will be repositioned and blocked so that no part, including cables, can come within the minimum clearances shown in the table.

MINIMUM DISTANCES FROM POWERLINES	
Nominal System kV	Minimum Required Distance
0-50	10 feet (3 meters)
51-100	12 feet (3.6 meters)
101-200	15 feet (4.6 meters)
201-300	20 feet (6.1 meters)
301-500	25 feet (7.6 meters)
501-750	35 feet (10.7 meters)
751-1000	45 feet (13.7 meters)

Note: For U.K. operations, the specific safe distance is determined by the utility company.

   c. The power line(s) has been isolated through the use of insulating blankets which have been properly placed by the utility. If insulating blankets are used, the utility will determine

the minimum safe operating distance; get this determination in writing with the utility representative's signature.

3. All inquiries regarding electric utilities must be made in writing and a written confirmation of the outage/isolation must be received by the Project Manager prior to the start of the task which may impact the utility.

D. Underground Utilities

1. Do not begin subsurface work (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted. The use of as-built drawings must be confirmed with additional geophysical or other surveys.

2. Contact utility companies or the state/regional utility protection service at least two (2) working days prior to excavation activities to advise of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation. The one call utility location service is available throughout the U.S. by calling 811. Where these services are unavailable (e.g., private properties), contract with an independent utility locating service to perform an evaluation of subsurface utilities.

3. Obtain utility clearances for subsurface work on both public and private property. Clearances are to be in writing, signed by the party conducting the clearance.

4. Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the Project Manager must notify the utility company, utility protection service, or the utility locating service to inform them that the markings have been destroyed.

5. Do not conduct mechanical-assisted subsurface work (e.g., powered drill rig, mechanical excavator, etc.) within five (5) feet (1.5 meters) of a confirmed or suspected utility or other subsurface structure. Confirm minimum distances for mechanical-assisted subsurface work with the utility owner, as distances beyond this five foot minimum may be required.

6. Non-destructive clearance techniques (e.g. vacuum extraction) are required prior to drilling/excavating in higher risk locations including chemical plants, retail service stations, or other locations with complex underground utility systems.

7. Subsurface work within five feet (1.5 meters) of a confirmed or suspected utility or other subsurface structure must be done by vacuum extraction (or related non-destructive technique) to the point where the obstruction is visually located and exposed. Once the obstruction location is confirmed in this manner, mechanical-assisted work may commence.

8. Reference SMS 013, "Excavation Safety" for additional information regarding subsurface operations.

E. Training

Conduct a briefing for site employees regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation.

5. Documentation Summary

File these records in the Safety Filing System:

1. Documents requesting utility clearance.

2. Documents confirming utility clearance.

3. Training/briefing documentation of each isolation.

6. Resources

A. Utility Locating Services (typically under "Utility" in the Yellow Pages)

B. NIOSH Alert - Preventing Electrocutions from Contact Between Cranes and Power Lines

C. One Call Utility Locating List

D. National Utility Locating Contractor's Association

E. U.K. - Health and Safety Executive GS6

URS SAFETY MANAGEMENT STANDARD
Work Zone Traffic Control

1. Applicability

This procedure applies to URS field operations involving work performed on roads, highways, and similar areas where motor vehicles may be a hazard.

2. Purpose and Scope

This procedure is intended to protect personnel from the hazards associated with work performed on or next to highways and roads.

3. Implementation

Field Activities - Implementation of this program is the responsibility of the Project Manager.

4. Requirements

A. Review the project in the planning phase to determine if any work will be performed on or adjacent to any road that will disrupt normal traffic flow.

B. Hire a qualified contractor or have an in house Competent Person devise a traffic control plan based on the work to be performed.

1. Competent persons are those who are knowledgeable about the fundamental principles of temporary traffic control and the work activities to be performed.

2. Traffic control plans will be designed to meet requirements as set in the Manual on Uniform Traffic Control Devices (MUTCD) as well as those rules set by state, county and cities in which work is performed.

3. Require that the plan is commensurate with the complexity of the project.

C. Submit the traffic control plan to the road authority for approval.

1. Submissions will be made to the state department of transportation or highways if state or federal highways are impacted as well.

2. Local county representatives.

3. Local city representatives, if within city limits.

4. For U.K. operations, submittal is to be made to County Council or local authority.

D. Decide whether to have qualified in house personnel or contract personnel implement the traffic control plan in the field.

1. Certified flaggers may set up work zones.

   Flaggers must attend an eight-hour work zone traffic control course as taught by an ATSSA certified instructor (or equivalent).

2. Obtain appropriate traffic control equipment as described in the MUTCD.

3. For U.K. operations, all operative must be trained in accordance with 'New Road and Street Works' Act.

E. Execute the traffic control plan developed for the job site. Require all personnel who work on/or adjacent to the roadway to wear bright orange, strong yellow-green or fluorescent versions of these colors of approved work zone clothing, including:

1. Vests, at a minimum.

2. Coveralls, if desired.

3. Rainwear or other apparel as needed.

F. Require a Competent Person who is certified as a Worksite Traffic Supervisor supervises flaggers at least once a day.

G. Develop a plan for the periodic inspection and maintenance of the Traffic Control Zone utilizing Attachment 32-1.

5. Documentation Summary

Records required in the Project Safety File:

A. Copies of traffic control plans used on site.

B. Training certificates for URS flaggers and Competent Persons.

C. Qualifications of contracted flaggers and Competent Persons.

D. Inspection records.

6. Resources

A. Part VI of the Manual on Uniform Traffic Control Devices (MUTCD)

B. American Traffic Safety Services Association

C. ATTSA Flagger Train the Trainer Program

D. U.K. - 'New Road and Street Works' Act

E. Australian Standards HB81.1-2003 - Field Guide for Traffic Controls at Work on Roads

F. Australian Standards AS1742.3-2002 - Manual of Uniform Traffic Control Devices

G. Australian Standards HB69.13-1995. Guide to Traffic Engineering Practice - Pedestrian

I. Attachment 32-1 - Traffic Control Inspection Checklist

URS	Health and Safety Program **INCIDENT REPORT FORM**	Attachment 49-1 Revision 2: May 2004

ADMINISTRATIVE INFORMATION:

URS Division/Company: _____

Project or Office: _____

Project Number: _____

Date/Time of Incident: _____ _____

Location/Client Name: _____ _____

TYPE OF INCIDENT
(Check all applicable items)

☐ Illness ☐ Injury ☐ Fire, Explosion, Flash ☐ Unexpected Exposure

☐ Property Damage ☐ Vehicular Accident ☐ Other (describe):

FOR INJURIES/ILLNESS ONLY

Name of Injured Employee _____ Phone No. _____

Describe Injury _____

Medical Treatment / First Aid _____

EMPLOYEES' DESCRIPTION OF INCIDENT: (Describe the facts contributing to the incident. Identify individuals involved, witnesses, and their affiliations. Attach additional sheets, drawings, or photographs as needed.)

_____

_____

_____

_____

_____

_____

_____

_____

Employee Name _____

Employee Signature _____ Date _____

URS	Health and Safety Program **INCIDENT REPORT FORM**	Attachment 49-1 Revision 2: May 2004

SUPERVISORS' DESCRIPTION OF INCIDENT: (Provide any additional/different details than provided by employee. Attach additional sheets, drawings, or photographs as needed.) Use additional sheets if necessary.

CORRECTIVE ACTIONS (*For Internal Use Only*):

REVIEWED BY:

Supervisor or Project Manager _____ Date _____

Office Manager _____ Date _____

Health and Safety Representative _____ Date _____

Supervisor must deliver this report to the office or project health and safety representative within 24 hours of the reported incident.

DISTRIBUTION: The Office or Project Health and Safety Representative distributes to:

- Office Manager
- Project Manager
- Project / Office file
- Regional Health and Safety Manager
- URS Occupational Health Nurses

  Fax: 512.419.6413
  URS Phone: 866.326.7321
  EG&G Phone: 866.344.1415

(For URS Asia/Pacific and Europe Operations – distribute this form in accordance with the directions in SMS 49.)

Note: The Regional Health and Safety Manager will distribute this Incident Report to other appropriate URS line managers as appropriate.

URS SAFETY MANAGEMENT STANDARD

Vehicle Safety Program

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

This Safety Management Standard (SMS) applies to employees operating motor vehicles that are owned, rented or leased by the Company, and the use of personal or government supplied vehicles while on Company business.

This SMS does not apply to heavy equipment operations (see SMS 019).

2. Purpose and Scope

This Safety Management Standard defines the policies that help URS minimize losses, injuries, and legal liabilities associated with improper vehicle use.

The Standard applies to operations world-wide. Some terminology may need to be read in context of local or national regulations for countries outside the US.

3. Implementation

The overall responsibility for program implementation is with the URS Office Manager. Other responsibilities include:

Administration -	Fleet management, participation in the Vehicle Safety Program, vehicle acquisition, insurance claims reporting, controlling access to vehicles, maintenance of vehicles, participating on accident review processes.
Human Resources -	Documentation of driver's license annually, participation in the accident review processes.
Health and Safety -	Employee safety training, maintenance of the vehicle safety program, and participation in the accident review processes.
Employee -	Familiarization with URS Vehicle Safety Program and compliance with its requirements.

4. Requirements

A. Authorized Drivers

1. Authorized Drivers are those individuals permitted to drive URS owned, leased, or rented vehicles, and employees driving a personal vehicle for work purposes being reimbursed mileage.

2. Must be at least 18 years of age (non-commercial license) or 21 years of age (commercial license) and have a current driver's license for the

appropriate class of vehicle (unless more stringent requirements are established by the leasing/renting agency).

3. Human Resources / Administration - will annually obtain and review a copy of the state issued drivers license for all Authorized Drivers'. The Operating Unit Manager shall audit this function annually. URS employees that are Authorized Drivers shall provide a copy of their driver's license upon request. Authorized drivers who lose their license through legal action ***must*** notify their Human Resources Representative immediately. The Human Resources Representative will notify the Fleet Manager.

4. Authorized drivers must:

    a. Review the Vehicle Safety Program (SMS 057) and sign the Drivers Information form (Attachment 57-2) annually.

    b. Report any conviction for driving under the influence of drugs or alcohol to the HR representative responsible for your office or operation.

    c. Complete vehicle safety training; URS online training module and other sanctioned driving courses described in section - 4.B. Training.

    d. Report all accidents. If the authorized driver has an accident in a URS owned, rented or leased vehicle, the accident must be reported immediately to the Office Manager. The SMS 57-1 form must be completed and submitted to the local Fleet Manager and copied to the Regional HS&E Manager (see 57-1 for reporting instructions).

    e. Cooperate with any URS investigation concerning the accident.

    f. Complete remedial driver safety training described in 4.B.2 as appropriate following an accident.

5. Non-URS employees (e.g., subcontractors, alliance partners) may operate URS vehicles only when this activity is specifically agreed to in the applicable contract, and only within the parameters of the contract and project plans.

6. URS operations or offices that plan vehicle use that requires compliance with Federal motor carrier regulations, the affected manager directing operations at the facility or site must obtain approvals from the URS Vice President of Health, Safety, and Environment and the URS Fleet Manager. This requirement typically applies to vehicles with a gross

vehicle weight over 10,000 pounds, vehicles carrying more than 15 passengers, or vehicles used for hazardous materials transport. The driver must have an appropriate commercial driver's license and may be subject to medical surveillance (see SMS 24).

7. Only Authorized Drivers can be reimbursed mileage for the use of their person vehicle on company business. Requests for reimbursements for mileage by non-designated drivers shall be denied.

B. Training

1. Authorized Drivers shall be provided basic driver safety training, including a review of the URS Vehicle Safety Program (SMS 057) and the on-line training within 3 months of their hire date.
2. Authorized Drivers shall complete the 4-hour web based defensive driving training program provided through the National Safety Council (NSC). Other defensive driving training programs that are equivalent or exceed the NSC training (i.e., the Smith Driving System) may be substituted by approval of the Regional Safety Manager. The internet web site for the NSC training is located at http://www.safetyserve.com/urscorp. Use **URSDDC** as the access code. **All URS authorized drivers shall complete this web-based training or equivalent training by 2010.**
3. Additional training is required for employees that have been involved in a chargeable vehicle accident where $2,000 in damages was sustained or when the accident includes a police citation. This additional training will be in the form of a behind the wheel training equivalent to the Smith Driving System.

C. General Operating Policy and Procedure (Applies to Authorized and Non-Authorized Drivers Operating Motor Vehicles on Official Company Business)

1. Only properly licensed employees who are specifically authorized to drive Company vehicles may operate company owned/rented/leased motor vehicles.
2. Authorized drivers required to operate vehicles with special hazards (i.e. trucks carrying fuel cells, vehicles used to tow trailers, vehicles with limited visibility, etc.) shall be thoroughly briefed on the hazards and control measures necessary for safe operation of the vehicle. The local Company operation shall maintain documentation of the briefing.
3. Drivers/operators shall know and obey all federal, state and local motor vehicle laws applicable to the operation of their vehicle.
4. A driver shall not permit unauthorized persons to operate a URS owned/rented/leased vehicle.
5. URS policy regarding reimbursement and insurance coverage requirements for use of personal automobiles may be found in the Policy

and Procedures Manual (Section 074.020). Only Authorized Drivers may be reimbursed mileage for the use of a personal vehicle.

6. All cargo extending 4 feet or more beyond the end of a truck, trailer or similar vehicle shall be clearly marked with a red warning flag or cloth measuring no less than 16 inches square. Red lights must be used at night.
7. Company owned/rented/leased vehicles are for official business use only and are not to be used for personal activities without the specific approval of a Division Manager, Senior Vice President, or the URS Fleet Manager.
8. Seat belts and shoulder harnesses (occupant restraint systems) shall be worn or used whenever the vehicle is in operation. The vehicle may not move until all passengers have fastened their restraints. Vehicles are not to be operated or used by Company employees if seatbelts are not included as part of the vehicle's safety equipment.
9. When parking or leaving a vehicle, the following procedures must be followed: Shut off the engine, engage the transmission in park (automatic transmission) or first gear (standard transmission), set the parking brake, remove the ignition keys, and lock the vehicle.
10. The vehicle's engine is to be turned off during refueling. Smoking or cellular phone use is not allowed while refueling.
11. Drivers/operators will not drive or operate vehicles while under the influence of alcohol or illegal drugs. Further details on the URS Substance Abuse Policy may be found in the Policy and Procedure Manual (section 034.030).
12. Drivers/operators will not drive or operate vehicles while under the influence of medications when told by a physician, another healthcare provider, or the manufacturer (i.e. instructions on the label) that the activity is unsafe.
13. Vehicle operators are responsible for any fines levied by law enforcement agencies for the operation of their vehicles.
14. Driver/operators may not deactivate or muffle any backup warning device.
15. Distractions while driving are a major cause of accidents. Distractions include the use of cellular phones, eating, and engaging in intense conversations. URS Authorized drivers must exercise proper control of the vehicle at all times, including the management of possibly distracting actions and behaviors. If you have to eat, pull over and park. If you become engaged in an intense conversation to the point of distraction, pull over and park or end the conversation.
16. **The use of cellular phones, including cellular phones with hands-free devices is prohibited.** If you need to make a call on a cellular phone, pull over and park in a safe area. This prohibition includes text messaging and other wireless devices (e.g. Blackberry).

D. Field / Site Vehicle Safety

1. Define specific vehicle travel routes and parking areas at field sites. Use fencing, cones or other markings to define roads and parking. SMS 32 provides additional information on Work Zone Traffic Control.
2. If parking on the shoulder of an active road, park as far off the road as possible.
3. If work is required alongside an active road (e.g., surveying) park the vehicle behind the area of work to provide a barrier against out-of-control vehicles.
4. URS will not transport DOT-placard quantities of hazardous materials. However, small quantities of hazardous materials (e.g., sample coolers) may be transported if properly packaged. Be careful to prevent chemical contamination of the vehicle. Further details on DOT shipping may be found in the DOT Shipping SMS 048.
5. Nuclear density meters (e.g., Troxler units) may be transported only by employees who have been trained in the use of nuclear density meters (see SMS 044). Nuclear density meters must be secured from movement and locked during transport. NRC and state-specific regulations regarding transport documentation also apply.
6. When performing fieldwork requiring the blocking of traffic lanes (e.g., bridge inspection), follow URS SMS 032, the Manual on Uniform Traffic Control Devices for Streets and Highways (ANSI D6.1) and local police requirements for barriers, cones, and flaggers.
7. No employee may ride in the bed of a pickup truck unless seating and restraints are provided for this specific use.
8. Articles, tools, equipment, etc. placed in vehicles shall be stored as not to interfere with vision or the proper operation of the vehicle in any way. This also includes preventing items from flying about or out of the vehicle during sudden stops, turning, etc.
9. Trucks or vehicles with obstructed rear-view mirrors must observe the following procedures when backing up: Position an employee to act as a spotter at the rear of the vehicles, in the driver's line of sight, to ensure that the area behind the truck is clear. If no other employee is present, then the driver must step out of the vehicle and check the area behind the vehicle before backing up. As an added precaution, avoid backing up whenever possible.
10. All uncontrolled intersections (no traffic lights or traffic signs) shall be treated as a 4-way stop. The driver shall exercise extreme caution at uncontrolled intersections.
11. URS drivers carrying more than 15 passengers shall perform route planning. Route planning will address hazards associated along the intended route including lack of traffic controls, speed, and hazards

associated with road conditions, weather, visibility, and other threats. Route planning shall be verified by the Office or Site Manager.

12. On buses and vehicles capable of carrying more than 15 passengers, no passengers may ride in a seat in the driver's row, which would otherwise impede the driver's lateral visibility.

E. Accident Response and Reporting

1. In case of injury, call or have someone else call, 9-1-1 immediately for emergency assistance. If you are involved in an accident and are not injured, do the following:

    a. Protect the accident scene.

    b. Do not admit liability or place any blame for the accident.

    c. Provide only your name, address, driver's license number, and vehicle insurance information.

    d. Obtain the following:

        i. name(s), addresses, and telephone number(s) of the owner

        ii. driver and occupants of other vehicle(s)

        iii. the owner's insurance company

        iv. driver's license number

        v. year, make, model and license number of the vehicle(s)

        vi. name(s) and addresses of any witnesses

    e. **DO NOT:**

    - Call the insurance company; the Fleet Manager's office will do this (unless the incident involves your personal vehicle).
    - Give a statement to the press.
    - Give a signed statement to the claims adjuster representing the other driver's insurance company.

    NOTE: The Auto Claim Report (Attachment 57-1) for Company-leased or owned vehicles is located in the vehicle glove compartment. The driver must complete this form at the scene of the accident and submit it to management along with a copy of the most recently submitted SMS 57-2 Driver's Information form.

2. Notification

    All accidents with a Company-leased, rented, or owned vehicle must be reported to your Office/Branch Manager/Supervisor and Regional HS&E Manager and local Fleet Manager within 24-hours of the time it occurs. Use the Auto Claim Report (Attachment 57-1) for this purpose.

The Fleet Administrator will report the accident to the insurance carrier (leased and owned vehicles only) promptly.

F. Accident Review

1. A violation of the policy in this Vehicle Safety SMS is subject to disciplinary action up to and including termination. The Fleet Manager will review all accidents involving URS-owned, rented or leased vehicles.

2. The Company may suspend the privilege to operate vehicles on Company business due to non-compliance with the URS Vehicle Safety Program, involvement in a motor vehicle accident, or resulting citations or other legal actions associated with motor vehicle violations. Personnel authorized to suspend an employee's status as an Authorized Driver include:

    a. A Project Manager with responsibility for dedicated vehicles on a site. The suspension is applicable to those site vehicles only.

    b. A URS Operations Manager responsible for the employee.

    c. The URS Fleet Manager.

    d. The URS Health and Safety Director.

3. The employee's driving privileges ***will be*** suspended for any of the following:

    a. Accidents or legal action involving alcohol or drug use (e.g., DUI).

    b. Driving without a license.

    c. Hit-and-run driving / leaving the scene of an accident.

    d. Unauthorized use of Company vehicles (i.e. using a company vehicle for moving personal items, carrying passengers who are not associated with work activities, etc…).

4. The employee's driving privileges ***may be*** suspended for any of the following:

    a. Two or more accidents involving the same Authorized Driver within a 12 month period

    b. Multiple speeding tickets or multiple citations for violations of the motor vehicle code.

    c. Multiple complaints from other employees or members of the public about driving performance.

d. Any accident caused by a URS Authorized Driver where damages exceed $2,000.

e. Failure to comply with the cellular phone use policy.

5. An Authorized Driver's driving privileges may be reinstated if:

   a. For any suspension resulting from law enforcement agency legal action involving drugs and alcohol on the part of the former Authorized Driver– the driving privileges may be reinstated only by concurrent agreement from the Operating Unit Manager, the URS Fleet Manager, the URS Health and Safety Director, and the appropriate Human Resources Regional Manager.

   b. For those Authorized Driver's privilege suspensions that are not related to driving under the influence of drugs or alcohol, privileges may be reinstated with concurrent agreement by the URS Operating Unit Manager and the URS Health and Safety Director upon completion of required remedial training (see section 4.B.2 of this SMS).

6. Disciplinary action includes possible:

   a. Loss of URS driving privileges

   b. Additional driver safety training (required for accidents resulting in more that $2,000 in damages – optional for all other accidents). Refer to section 4.B. Training.

   c. Suspension without pay

   d. Termination

G. Inspection

1. The driver is responsible for inspecting the vehicle prior to use and not driving a vehicle with obvious safety defects.

2. Basic safety checks must include:

   a. Tire condition/pressure

   b. Lights/turn signals

   c. A clean windshield and adequate window washer fluid

   d. Gauges/warning lights indicating a normal condition

   e. Mirrors properly adjusted

   f. Brakes with adequate pedal pressure for proper braking

   g. Any defects must be reported to the local office Fleet Representative/Office Administrator.

   h. Vehicle Maintenance

i. The Office Administrator (or designee) is to ensure that all URS-leased/owned vehicles are properly maintained.

j. Routine maintenance must be performed in accordance the schedule provided in the owner's manual stored in the vehicle.

k. Reported defects/problems with vehicles must be repaired promptly.

5. Documentation Summary

A. Auto Claim Report - (Attachment SMS 57-1)

B. Driver's Information - (Attachment SMS-57-2)

6. References

The following sites provide additional information to assist you:

A. National Safety Council; Information on Defensive Driving Courses
http://www.nsc.org/psg/ddc.htm

B. AAA Foundation for Traffic Safety
http://www.aaafts.org/

C. Smith Driving System
http://smith-system.com/

D. 4-Hour Defensive Driver Training
http://www.safetyserve.com/urscorp password: URSDDC

URS **SAFETY MANAGEMENT STANDARD**

Worker Right-to-Know (Hazard Communication)

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

The worker right-to-know program provides URS personnel with information and training about safety and health hazards associated with the chemicals they might encounter in the workplace. This procedure describes how chemical safety hazards are communicated to URS personnel and how information is to be provided to employees of other employers working at the location. The requirements include steps to acquire this information, maintain it, and train personnel in the hazard communication program.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. Hazardous Material Inventory:

Maintain a hazardous material inventory that lists all of the hazardous materials used at each workplace (i.e., office/field location). Use chemical names consistent with the applicable material safety data sheet (MSDS).

B. Material Safety Data Sheets (MSDS)

1. Obtain a MSDS for each chemical before it is used.

2. Review each MSDS when it is received to evaluate whether the information is complete and to determine if existing protective measures are adequate.

3. Maintain a collection of all applicable and relevant MSDS where they are accessible by all employees at all times.

4. Replace MSDS when updated sheets are received. Communicate any significant changes to those who work with the chemical.

5. MSDS are required for all hazardous materials used on site by project personnel.

C. Labels

Unless each container has appropriate labeling, label all chemical containers with:

1. Identity of the hazardous chemical(s),
2. Appropriate hazard warnings, and
3. Name and address of the chemical manufacturer, importer, or other responsible party.

D. Hazardous Nonroutine Tasks

Periodically, employees are required to perform hazardous non-routine tasks. Prior to starting work on such projects, provide each employee with information about hazards to which they may be exposed during such an activity.

This information will include:

1. Specific chemical hazards.
2. Protective/safety measures which must be utilized; and
3. Measures that have been taken to lessen the hazards including ventilation, respirators, presence of another employee and emergency procedures.

E. Informing Contractors/Subcontractors

Provide contractors/subcontractors the following information on chemicals used by or provided to URS personnel:

1. Names of hazardous chemicals to which they may be exposed while on the jobsite.
2. Precautions the employees may take to lessen the possibility of exposure by usage of appropriate protective measures.
3. Location of MSDS.

F. Training

1. Conduct training of all employees potentially exposed to hazardous materials on the following schedule:

    a. Before new employees begin their jobs.

    b. Whenever new chemicals are introduced into the workplace, or

    c. Annually thereafter.

2. This training will include:

    a. Applicable regulatory requirements.

    b. Names of those responsible for implementing this program.

    c. Location of the program, inventory and MSDS.

    d. Chemicals used and their hazards (chemical, physical and health).

    e. How to detect the presence or release of chemicals.

    f. Safe work practices.

    g. How to read an MSDS.

3. Document the training.

4. Where non-English speaking workers are employed, provisions for training in the appropriate language shall be arranged.

5. Documentation Summary

A. File these records:

1. Chemical Inventory.

2. Location of the MSDS inventory.

3. Training records.

4. Contractor/Subcontractor notifications.

6. Resources

A. U.S. OSHA Technical Links - Hazard Communication

B. U.K. - Control of Substance Hazardous to Health - Regulations

References to the UK legislation listed above can be found at the link provided:

www.tionestop.com
username: Thorburn
password: Dames
enter search criteria – (see underlined text)
select the checkbox for Construction Information Service (CIS)

C. National Paint and Coatings Association (NPCA) Hazardous Materials Identification System (HMIS) Version III

D. National Fire Protection Association (NFPA) Standard 704 (Standard System for the Identification of Hazardous Materials for Emergency Response)

Appendix C

Compliance Agreement Form

ATTACHMENT C
COMPLIANCE AGREEMENT FORM

Project Number:	19997570.00002
Project Name:	Act 2 Remedial Investigation Rohm and Haas Philadelphia Plant
Project Manager:	Geoff Arbogast
Date:	October 2007

I, _____ (print name), have received a copy of the Health and Safety Plan for the above referenced project. I have read and been familiarized with the Plan, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited form working on the project for violating any of the safety requirements specified in the Plan.

SIGNED:

_____ _____

SIGNATURE **DATE**

FIRM: _____

Appendix D
Emergency Phone Numbers

EMERGENCY PHONE NUMBERS

(to be called in the event of an emergency)

	Radio Call Sign (Band 1F)
SPILL REPORTING	**x 2500**
MEDICAL EMERGENCY	**x 2500**
FIRE (ONSITE BRIGADE)	**x 2500**
HOSPITAL (Frankford Division)	**(215) 831-2000**
MR. AL AMBROSINO Remediation Coordinator Rohm and Haas Philadelphia Plant	**(215) 537-4116** **48**
MR. JEFFREY KOZUB EHS Manager Rohm and Haas Philadelphia Plant	**(215) 537-4086** cell **(267) 263-5777**
MR. CARL COKER Corporate Remediation Project Manager Rohm and Haas Company	**(215) 785-7193**
MR. GEOFF ARBOGAST Project Manager URS	**(215) 367-2500**
MR. DOUG MUELLER Health, Safety, and Environment Representative URS	**(215) 367-2500**
MR. BEN BERTOLOTTI Regional Health, Safety, and Environment Manager URS	**(973) 572-3916**

Appendix E

Rohm and Haas and URS Reporting of Illness and Injuries

10.7

FORM 907A - ROHM AND HAAS ILLNESS AND INJURY INCIDENT REPORT

HEADER

CASE NUMBER (I/A log)	WORK AREA NAME	LOCATION ADDRESS

DATE OF INCIDENT	TIME OF INCIDENT	START OF WORK TIME	Date Completed

KEYWORD DESCRIPTION OF INCIDENT (EVENT)

DETAILS re ACCIDENT VICTIM

EMPLOYEES NAME		MALE/FEMALE

HOME ADDRESS	HIRE DATE

CITY	COUNTRY – STATE	ZIP

DETAILS ABOUT THE INCIDENT

ACCIDENT LOCATION DESCRIPTION	WORK RELATED

WHAT WAS EMPLOYEE DOING AND WHAT HAPPENED

WHAT OBJECT OR SUBSTANCE DIRECTLY HARMED THE EMPLOYEE

Primary Cause

Employee Activity

Causing Object

PPE involved

PPE involved

Secondary Causes

DETAILS ABOUT THE INJURY

ACCIDENT CATEGORY	DATE OF DEATH	DESCRIPTION OF INJURY OR ILLNESS

MEDICAL TREATMENT GIVEN

INITIAL TREATMENT BY	EMERGENCY ROOM CARE	HOSPITALIZATION	RETURN DATE

PHYSICIAN/HC PROFESSIONAL NAME	HOSPITAL/CLINIC NAME & ADDRESS

REQUIRED SIGNATURES:

COMPLETED BY	DATE	PHONE	TITLE

The information in this form must be submitted in SAP. A copy of this form can be found at http://ehs.rohmhaas.com/safety/Iir/index.htm.